RAILROAD GAZETTE

FRIDAY, OCTOBER 13, 1876.

Contributions.

Vicissitudes of Steamboat Travel.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It is better to be born poor than bashful. After buffeting mankind for thirty-five years and spending more than half that time among railroad men, I am still diffident.

I fall an easy victim to hotel clerks, who always room me in the sky parlor; to Pullman car conductors, whose berths are invariably all taken except an upper one over the wheels; and to steamboat officials, who completely chaw me up. It recently happened that I was in New York city, and necessity compelled a further trip to Providence. The shore and the Sound lines *via* Stonington were familiar to me, but at the last moment a friend advised the Fall River route. Time was short and I rushed, satchel and umbrella in hand, for the boat. My friend screamed down the elevator after me, "Look out for yourself on the boat:—Men are frequently robbed, thrown overboard and never heard from." His caution caused me to quake with fear, but under the pressure of my purpose I started on the double-quick for the dock. Fifty boys, at intervals, yelled "carry your satchel for a quarter"—"carry it for a dime;" but receiving no response they hurled at me every variety of epithet, and I considered myself fortunate to escape being followed by the cry of "stop thief." Arrived at the steamboat office, I slammed down my satchel and out with my pocket-book to purchase a ticket. The agent inside sung out, "Hustle yourself aboard, young man, or you are left." Without stopping to thank him for the compliment as to my age, I dove under the shed and struck the gang plank just in time to be sprawled on board, my satchel and umbrella one way and I the other. The lower deck was full of passengers who laughed at my confusion, and as the boat did not leave for some minutes, I had an abundance of time to rub my shins and reflect upon the uncertainty of life before we were fairly under way. A long line of lugubrious individuals were wending their way to the clerk's office, and I took place at the rear end. Slowly I pegged up a step at a time, satchel in hand, toward the window. It was one of the hottest of August days and the perspiration fairly ran from my brow. The first glance of the clerk dried it all up and sent a chill over me, and the voice in which he demanded "Where to?" froze my blood. "Rail from Fall River?" he inquired. At my answer, "Boat from Fall River," he cast one withering glance which nearly annihilated me. "Four dollars, quick," he said; but my wits were quite dispersed and it took time to find the money. In my timidity I looked round, and seeing myself the last man to be served, could not understand the gentleman's extreme haste. "State room for one," I said. "Haven't any," he thundered out, and I tried to discover if lightning had struck any where. I shook a five dollar bill in his face, but he was proof against the temptation. As I turned away, he said "Can give you a bunk," and he noted down on the ticket a number somewhere up in the thousands. I picked up my bag and umbrella and started for that bunk. The first porter I struck sent me to the upper tier of state rooms; arrived there, the second sent me down again; the third sent me to the lower cabin, and the fourth to the forward hold. After much perambulation, up and down, this way and that, through a confusion of people, I approached my destination. Three or four darkies passed me round, each ordering the other to show me the bunk, which the last concluded to do. I was about to deposit my baggage when he sang out "What are you doing there?" in so threatening a manner that I instinctively dropped everything and placing one hand on my watch and the other on my pistol pocket awaited his attack. After the pause of a minute, however, he proved to be a friend in disguise by giving the information that anything left there would never be seen again and directed me to the baggage room. This brought fully to mind my friend's warning and filled me with fresh terror. Carrying myself with much circumspection, I succeeded at length in getting a check for the bag and umbrella. In the meantime supper was announced, and feeling an inward craving, I indulged in a repast equal in many respects to what has often cost me twenty-five cents, but the bill in this instance was one dollar and fifty cents. "How mysterious are the ways of *Providence!*" I reflected, for it had now dawned upon me that this was the name of the boat. The shades of evening had come on, and as people were flocking to the cabin, I took a seat and listened to the music as it wafted itself through the boat. She glided past in all her gilded beauty, and it was evident to even the casual observer that there were persons who would willingly furnish state-room accommodations even if the clerk could not. Protected by my modesty when drowsiness came on, I descended to the infernal regions below for rest. The heat was terrific, and around were congregated darkies from the cook-room and elsewhere, indulging in amusements congenial to their inclinations. I piled into my bunk, while a young pandemonium raged in close proximity. It was impossible to sleep on account of the heated atmosphere and the racket. Late at night I sank into an uneasy slumber, full of terrible dreams, and finally sprang out of bed imagining that a horrid black wretch was trying to carry me away. It proved to be only the darkey who was announcing Fall River, and by a vigorous effort I shook off the effect of my night's dissipation and recovered my senses. It was just dawn, and stumbling out on deck I found the train leaving for Boston, but the Providence train did not start till eight o'clock. The previous evening I discovered there was a change of boats and a long delay at Fall River, and the clerk coolly proposed to take up the Providence coupon without allowing anything for it, which generous offer was declined. By this time I was sick of steam-boating and fully determined to go to Providence by rail. I sauntered around the boat till breakfast was ready, which was secured at a cost of one dollar and seventy-five cents. Being in a subdued state, I ate what was placed before me quietly, but nevertheless enjoyed the squabble carried on between a gentleman sitting opposite who was in a hurry for his breakfast while the waiter was determined to serve him when it suited his own sweet will. The bunk in which I had slept was the upper one in a tier of three, and when rising I noticed the lower ones had not been occupied. As mine was the most uncomfortable, I resolved to upbraid the clerk for not having done as well by me as he might. Watching my opportunity I approached and introduced the subject. He shut me up at once by announcing the curious fact "that this is the Centennial year," and added, "Nothing better can be expected by this line, and if you don't like it go by the Shore route." Having been disposed of so satisfactorily, I inquired the exact leaving time of the Providence train. He pointed to a man at the gangway, who condescended to say it would be announced when ready. Not daring to ask any more questions I hung round for a couple of hours. Suddenly a man demanded my ticket and intimated that I had better "*git.*" This I did with alacrity, and had just time to jump on the Providence train to avoid being left. As the train sped on its way I reflected: This is indeed the great Centennial year! It is the year for the display of gush and patriotism! It is also highly proper that the other great American characteristic, *cheek*, should be exhibited. I looked in vain for the article at the Centennial, and lest any native or foreign visitor should be obliged to go home without seeing the curiosity in its perfection, a trip on the Fall River Sound line of steamers is recommended, where the very embodiment of "cheek" can be seen in the employes of that company. To ascertain if this talent was monopolized by the Fall River line, I returned to New York by the Stonington steamer. To my astonishment I was accommodated with a comfortable state-room and an apology that it was no better. The officers of the boat were so attentive to the comfort of their passengers that the conviction forced itself upon me that they must be new to the business and had not learned that to be a good steamboat man it is necessary to cease to be a gentleman. Such old-fogy notions are astounding at this period of our national existence. Just why it is necessary to spend hundreds of thousands of dollars for elaborate steamboats and then employ a horde of sea ruffians to run them is a conundrum which only newspaper men are competent to find out.

GEORGE H. BLISS.

Erecting Locomotive Guide Bars.

ST. PAUL, Oct. 2, 1876.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I see by last week's *Gazette* a plan for setting locomotive guides by. According to his idea, those at the big show in Philadelphia are all wrong. Now I do not know anything about those at the big show, but suppose they are pretty near right. But, Mr. Editor, I will ask a favor, that is, to try and get the correspondent who wrote the article about setting guides not to revolutionize the machine shops by having us all set guides after his plan; and I will now ask, in the name of all practical machinists, if your correspondent will give us a rest on that mode of setting guides, and let those who do not know learn from some good machinist. *Thus:* run a fine line through the centre of the cylinder. After setting it central with the bore of cylinders, try the centre of hole in cross-head which receives piston-rod with the bottom bearing or wings. If it be central set the bottom plates of guides central, and if not central set to correspond. By setting bottom plates in this manner, if correctly done, all there is then to be done, if cross-head is properly planed, is to lay cross-head on the guides and lay top plates in their place. Try both ends of guides and see if they measure the same between, and the job is complete. Now, Mr. Editor, if he is a book-learned mechanic, I will forgive him, but if not, he must bag his head, for his advice is no good to new beginners, and old heads only smile at it. Now, in the first place, how is he going to keep his piston-rod central without setting out his packing in cylinder? Next, the bushing in gland must be a perfect fit on piston-rod, and if he does this how can he move the cross-head up and down or in and out without a great deal of help? And if he gets his guides set in that manner, he must then take cross-head off and bore out the gland or the expansion will cause the piston-rod to bore it out for him when the engine goes out.

YOUNG MACHINIST.

The Justifiable Expenditure in Improvement in the Alignment of Railways.

BY A. M. WELLINGTON, C. E.

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(Continued from Page 433.)

REDUCTION OF RULING OR MAXIMUM GRADE (CONTINUED).

The Ratio of Adhesion (i. e., the ratio of the tractive power of the engine to the weight on the drivers).—This varies from 1-3 to 1-7. The *mazimum* adhesion, about 36-100, is shown by Colburn's experiments on the Erie Railway, before referred to. Experiments by Mr. Reuben Wells, the able Master Mechanic of the Jeffersonville, Madison & Indianapolis Railroad, on the Madison inclined plane, indicate that an adhesion of about ⅓ may be relied on under favorable circumstances, as shown in the following extract from Mr. Wells' report:

"The engine is what is called a tank engine, with cylinders 20⅛×24 inches. The wheels are all drivers, and consist of five pair, 44 inches in diameter; tires, steel. The inclined plane is 6,940 feet in length, and the track is inclined 1 in 16½=320 feet per mile. A train of eight loaded cars was taken up this grade as follows:

"Weight of engine, 54 tons; weight of train, 154 tons; total, 208 tons; speed at starting on the incline, 2 miles per hour; steam pressure, 140 lbs.

"Average speed, 6.06 miles per hour; fuel consumed, 0.56 cord of wood; time consumed in overcoming the elevation of 420 feet, 13 minutes; pressure at top of incline, 130 lbs.

"The power requisite to overcome the force of gravity on this incline would be 1-16.5 the total weight of the train, or 25,212 pounds, and if we add eight pounds per ton for rolling and journal friction, we have then a total of 26,876 pounds. To overcome this, an effective pressure of 122 pounds per square inch is required, which is equivalent to 434 horse-power, or 14,324,908 foot-pounds per minute. The weight on the drivers available for adhesion on the incline is 1-16½ less than the weight on a level track, and in this case would be 101,455 pounds.

"Leaving off the power absorbed in rolling and journal friction of the engine, the adhesion of the drivers to the rails required to take this engine and train up the grade would be 25,286 pounds, or 24¾ per cent. of their total weight on the rails. The rails were dry and there was no indication of slipping at any time, and no sand was used; therefore we may conclude that the adhesion of a steel tire to a dry iron rail, at slow speeds, and on a straight track, is, in round numbers, at least 25 per cent. of the weight on the rail." ("Report on Locomotive Tests" to Master Mechanics' Association, *Railroad Gazette*, May 26, 1876.)

On the other hand, it is very frequently the case that an adhesion as low as 1-7 cannot be realized in bad weather, and in the grass-hopper region, when the forage is good and the grass-hoppers in good condition, it would doubtless fall very nearly to the ultimate limit of $\frac{1}{\infty}$.

Coming in between these extremes, we find, as might be expected, by consulting Table XV., that practical experience has shown it to be most advantageous and economical to adapt the habitual loads to an average adhesion of about 1-5. We shall *therefore* adopt it as the standard for this paper, and not because it measures the actual ratio of adhesion, which doubtless is usually somewhat higher and occasionally somewhat lower. In the estimate for the Portland & Ogdensburg Railroad, before referred to, Mr. Latrobe assumed 1-7 as the standard for the adjustment of gradients, but the same considerations are applicable to such an assumption as those with respect to the rolling friction assumed in the same estimate, remarked upon above. The practical effect is to adapt the unchangeable gradients to an assumed standard which is highly exceptional, and different from that which the ordinary daily practice of railways has shown to be advisable and economical. The less the ratio of adhesion, the less the *comparative* effect of gradients, and hence the less their cost. Hence, to adopt so low a standard as 1-7 is to unduly depreciate their cost. For the purpose, however, of adjusting gradients for an unequal traffic, which was the purpose of Mr. Latrobe's estimate, the ratio of adhesion assumed makes far less difference, as we shall see. In fact, Mr. Latrobe's estimate, having been made for an engine having all its weight on the drivers, agrees almost exactly on the higher grades with those we shall deduce, with our different premises, for the more common patterns of engines; after correcting some obvious numerical errors into which—singularly enough—that distinguished Engineer has fallen, and which—still more singularly—seem to have escaped detection during the construction of the road, which has accordingly been reduced, as we shall see, to a grade 15 feet per mile lower, going east, than it was Mr. Latrobe's evident *invention* to recommend.

Ratio of the Weight on the Drivers to the gross weight of the Engine and tender.—This is a pure question of fact, data for which are given in Table XVI. below for different patterns of engines. Table XVI. also gives the statistics of actual weight, but with these we shall have nothing to do, dealing only with ratios. The smaller this ratio the greater is the cost of high gradients, since the dead weight of the engine—which must be hauled, but does not help to increase the tractive power—is then greater, and hence the *net* load—from which a fixed reduction must be made if the gradient is increased—is so much the less. Therefore, in order not to *overestimate* the cost of gradients, we should not adopt too small a value for this ratio. The "Mogul" pattern in various forms is coming more and more into use, and an estimate of 0.5 for this ratio, for that pattern, would seem by Table XVI. a fair and sufficiently large average. For what is known as the "Standard American" pattern, as shown in the Baldwin and Pennsylvania Railroad standard passenger engine, this estimate is too large, and about 0.4 or 0.45 would be an average. On the other hand, for the rarely used "Consolidation" pattern (and still more for all tank engines), it is too small and should be 0.6 to 0.7. But except in the latter case it is large enough at least and errs if at all on the conservative side. We may add that the effect of variations in this ratio and the ratio of adhesion is very small, comparatively speaking, on gradients of less than 80 or 100 feet per mile. As the grade is increased much beyond that, they become rapidly more important.

By combining these two ratios, we determine the following compound ratio, which is the one we really require, viz.:

The ratio of the tractive power to the total weight of the engine and tender.—The ratio of adhesion being 1-5, and the weight available for adhesion being 0.5, or ⅗ of the gross weight of engine and tender, we have 1-5 × ⅗ or 1-10 of the gross weight as the tractive power of the engine, or, in other words, the weight of the engine is 10 times the traction. This corresponds closely with the observed facts on various railways, as directly determined by the formula already given and shown in Table XV. For the "standard American" engine we should have $4\text{-}10 \times 1\text{-}5 = \frac{1}{12.5}$, or $\frac{45}{100} \times \frac{1}{5} = \frac{1}{11.1}$, *i. e.*, the weight of the engine is from 11 to 12½ times the traction, and on the other hand for the "Consolidation" or tank engine we should find the weight to be only about 8 times the traction, but in the latter case if the ratio of adhesion be taken as only 1-7, we shall find the ratio of the gross weight to the traction to be about 10, the same as for the "Mogul" engine with 1-5 adhesion.

We have now all the data required to construct the followin table (Table XVII.), which will enable us to solve sever

problems in respect to gradients in a general form, independent of the exact weight of the engine and train and even to a considerable extent of the pattern of engine and ratio of adhesion, since, as already stated, we shall see that their effect is comparatively small on ordinary gradients. Table XVII. will form the basis of the remainder of this paper, and is given in full for the convenience of the reader for checking and other purposes, although an abridgement might possibly serve our immediate purpose.

TABLE XVII.

Showing, for any grade, the ratio of the customary gross and net load of an engine to the tractive power; or, the load in tons per ton of traction. Also, the resistance from gravity only and the total resistance in lbs. per ton of 2,000 lbs. According to the average daily experience of the the Pennsylvania, the Philadelphia & Reading, the Erie and other railways, shown in Table XV.

Grade in feet per mile.	Resistance in lbs. per ton.		Ratio of load to tractive power.	
	From gravity only.	Total resistance.	Gross load.	Net load.
Level	0 0	10.00	200.00	190.0
1	0.38	10.38	192.68	182.7
2	0.76	10.76	185.86	175.9
3	1.14	11.14	179.50	169.5
4	1.52	11.52	173.67	163.7
5	1.90	11.90	168.12	158.1
6	2.27	12.27	162.9	152.9
7	2.65	12.65	158.04	148.0
8	3.03	13.03	153.45	143.5
9	3.41	13.41	149.12	139.1
10	3.79	13.79	145.10	135.1
11	4.17	14.17	141.17	131.2
12	4.55	14.55	137.50	127.5
13	4.93	14.93	134.00	124.0
14	5.30	15.30	130.7	120.7
15	5.68	15.68	127.5	117.5
16	6.06	16.06	124.5	114.5
17	6.44	16.44	121.6	111.6
18	6.82	16.82	118.9	108.9
19	7.20	17.20	116.3	106.3
20	7.58	17.58	113.8	103.8
21	7.96	17.96	111.4	101.4
22	8.33	18 33	101.1	99.1
23	8.71	18.71	106.9	96.9
24	9.09	19.09	104.8	94.8
25	9.47	19.47	102.7	92.7
26	9.85	19.85	100.8	90.8
27	10.23	20.23	98.9	88.9
28	10.61	20.61	97.0	87.0
29	10.97	20.97	95.3	85.3
30	11.36	21.36	93.6	83.6
31	11.74	21.74	92.00	82.0
32	12.12	22.12	90.43	80.4
33	12.50	22.50	88.90	78.9
34	12.88	22.88	87.41	77.4
35	13.26	23.26	86.00	76.0
36	13.64	23.64	84.60	74.6
37	14.02	24.02	83.26	73.3
38	14.40	24.40	81.96	72.0
39	14.78	24.78	80.71	70.7
40	15.15	25.15	79.50	69.5
41	15.53	25.53	78.31	68.3
42	15.91	25.91	77.79	67.8
43	16.29	26.29	76.09	66.1
44	16.67	26.67	75 02	65.0
45	17.05	27.05	73.96	64.0
46	17.42	27.42	72.93	62.9
47	17.80	27.80	71.93	61.9
48	18.18	28.18	70.96	61.0
49	18.56	28.56	70.02	60.0
50	18.94	28.94	69.11	59.1
51	19.32	29.32	68.21	58.2
52	19.70	29.70	67.34	57.3
53	20.08	30.08	66.49	56.5
54	20.46	30.46	65.66	55.7
55	20.83	30.83	64.87	54.9
56	21.21	31.21	64.08	54.1
57	21.59	31.59	63.31	53.3
58	21.97	31.97	62.56	52.6
59	22.35	32.35	61.83	51.8
60	22.73	32.73	61.10	51.1
61	23.11	33.11	60.41	50.4
62	23.49	33.49	59.73	49.7
63	23.87	33.87	59.06	49.1
64	24.24	34.24	58.39	48.4
65	24.62	34.62	57.77	47.8
66	25.00	35.00	57.14	47.1
67	25.38	35.38	56.59	46.5
68	25.76	35.76	55.94	45.9
69	26.14	36.14	55.34	45.3
70	26.52	36.52	54.78	44.8
71	26.90	36.90	54.24	44.2
72	27.27	37.27	53.66	43.7
73	27.65	37.65	53.11	43.1
74	28.03	38.03	52.59	42.6
75	28.41	38.41	52.07	42.1
76	28.79	38.79	51.56	41.6
77	29.17	39.17	51.06	41.1
78	29.55	39.55	50.57	40.6
79	29.93	39.93	50.10	40.1
80	30.30	40.30	49.62	39.6
81	30.68	40.68	49.16	39.2
82	31.06	41.06	48.71	38.7
83	31.44	41.44	48.26	38.3
84	31.82	41.82	47.82	37.8
85	32.20	42.20	47.40	37.4
86	32.58	42.58	46.98	37.0
87	32.96	42.96	46.56	36.6
88	33.33	43.33	46.16	36 2
89	33.71	43.71	45.76	35.8
90	34.09	44.09	45.36	35.4
91	34.47	44.47	44.98	35.0
92	34.85	44.85	44.60	34.6
93	35.23	45.23	44.22	34.2
94	35.61	45.61	43.86	33.9
95	35.97	45.97	43.49	33.5
96	36.36	46 36	43.13	33.1
97	36.74	46.74	42.79	32.8
98	37.12	47.12	42.44	32.4
99	37.50	47.50	42.10	32.1
100	37.88	47.88	41.78	31.8
102	38.64	48.64	41.11	31.1
104	39.40	49.40	40.49	30.5
106	40.15	50.15	39.88	29.9
108	40.91	50.91	39.28	29.3
110	41.67	51.67	38.71	28.7
112	42.42	52.42	38.15	28.2
114	43.18	53.18	37.61	27.6
116	43.94	53.94	37.08	27.1
118	44.70	54.70	36.56	26.6
120	45.45	55.45	36.07	26.1
122	46.21	56.21	35.58	25.6
124	46.97	56.97	35.11	25.1
126	47.73	57.73	34.64	24.6
128	48.49	58.49	34.20	24.2
130	49.24	59.24	33.76	23.8
132	50.00	60.00	33.35	23.4
134	50.76	60.76	32.92	22.9
136	51.52	61.52	32.52	22.5
138	52.27	62.27	32.12	22.1
140	53.03	63.03	31.73	21.7
145	54.92	64.92	30.80	20.8
150	56.82	66.82	29.93	19.9
155	58.71	68.71	29.11	19.1
160	60.61	70.61	28.33	18.3
165	62.50	72.50	27.59	17.6
170	64.40	74.40	26.88	16.9
175	66.29	76.23	26.21	16.2
180	68.19	78.19	25.58	15 6
185	70.08	80.08	24.98	15.0
190	71.97	81.97	24.40	14.4
195	73.87	83.87	23.85	13.9
200	75.76	85.76	23.32	13.3
210	79.55	89.55	22.34	12.3
220	83.33	93.33	21.42	11.4
230	87.12	97.12	20.60	10.6
240	90.91	100.91	19.82	9.8
250	94.70	104.70	19.10	9.1
275	104.17	114.17	17.52	7.5
300	113.64	123.64	16.18	6 2
325	123.11	133.11	15.04	5.0
350	132.59	142.59	14.03	4.0
375	142.06	152.06	13.15	3.1
400	151.52	161.52	12.38	2.4
425	161.00	171.00	11.70	1.7
450	170.46	180.46	11.08	1.1
500	189.40	199.40	10.00	0.0

REMARK.—The above table is based upon a rolling friction of 10 lbs. per ton, adhesion 1-5, and ratio of weight on drivers to gross weight of engine and tender 0.5. Corresponding ratio of the tractive power or adhesion to gross weight of engine, 1-10.

The table can be tested by multiplying any known load which is habitually hauled by an engine up given ruling grades, by the tractive power, or 1-5 of the weight on the drivers.

The second column of Table XVII. gives the resistance of gravity on each grade per ton of 2,000 lbs., which is easily determined by the formula already given. The third column gives the total resistance per ton on each grade by adding 10 lbs. rolling friction to the second column. Then, to determine the fourth column, the total resistance in pounds per ton on each grade, divided into 2,000, will give the *ratio* of the gross load to the traction, whatever the size and power of the engine. If the total resistance per ton be only 10 lbs., as on a level, we have $\frac{2,000}{10} = 200$, *i. e.*, the gross load is 200 times the tractive power of the engine. If the total resistance per ton be 37.88 lbs., as on a 100 feet grade, the gross load will be only $\frac{2,000}{37.88} = 41.78$ times the tractive power of the engine.

To determine the *net* load per ton of traction, which is given in the fifth column, we have only to subtract 10 from the gross load in the fourth column; inasmuch as we have already estimated the gross weight of the average freight engine to be ten times the tractive power. We have thus determined the *ratio* of the net load to the tractive power on any grade independent of the weight of the engine or train. Of this column we shall make frequent use.

We are now prepared to determine the law which governs the effect of an increase or decrease in the rate of various grades, which we must postpone to the next number.

NOTE ON THE WASTAGE OF FUEL FROM RADIATION.

In estimating the cost of curvature and rise and fall, we have estimated the wastage from this source as equal to 10 per cent. of the total cost of fuel. The substantial correctness of this estimate is confirmed by some experiments of Mr. Reuben Wells, Master Mechanic of the Jeffersonville, Madison & Indianapolis Railroad, as given in the "Report on Locomotive Tests" to the Master Mechanics' Association. (Published in the *Railroad Gazette*, May 26, 1876). We quote Mr. Wells' own words:

"On making a test, which was continued for 12 hours, it was found that it required 25 pounds of coal per hour to keep up a steam pressure of 80 pounds per inch, in the boiler of engine No. 40, when it was clean and in good order and perfectly tight; the boiler had been lately covered with pine lagging and Russia iron jacket, the dampers to the ash-pan were kept closed, and no steam was allowed to escape or leak out, nor was the engine moved during the 12 hours referred to, nor was there any water put into the boiler during that time, and at the end of the test but little difference in the water level could be noticed from that at the beginning. From this it would seem that 25 pounds of coal per hour is required to make good the heat lost by radiation alone, from a boiler of this size, containing 8,200 lbs. of water, under the conditions stated above. At the time of the test the engine stood on a side track, and the temperature of the atmosphere averaged 50 degrees. There was no wind. The test was made March 14.

"At another time, the same month, a four-wheel switching engine weighing 16 tons was kept under steam for 10 consecutive hours, at an average pressure of 80 pounds. No steam was allowed to blow off, the dampers to ash-pan were kept closed, but during the time the engine was run one quarter of a mile to 'pump up,' in order to make good the loss of water from the escape of steam through slight leakage at the throttle and safety valves. In this case the consumption of coal was 32 pounds per hour."

By referring to the "Monthly Locomotive Returns" published in the *Railroad Gazette*, we find that the average consumption of coal per mile run on the Jeffersonville, Madison & Indianapolis Railroad is something under 45 lbs., and this is not far from the general average of all the reports. At an average speed of 20 miles per hour this would amount to about 900 lbs. per mile. Then, 25-900 and 32-900 = from 2.8 to 3.5 per cent. of the total consumption, as the wastage of fuel from radiation *when an engine is in perfect order, wholly protected from wind, and using no steam in the cylinders.* The most moderate estimate would be that the radiation would reach three or four times this amount for an engine in average condition, while using steam and in rapid motion.

THE PERCENTAGE OF CHANGE IN THE NET LOAD RESULTING FROM ANY GIVEN CHANGE IN THE RATE OF ANY GRADE.

We have already determined premises for this purpose in Table XVII., given in the previous paper. The fifth column of that table shows, for any grade, the ratio of the net load to the adhesive or tractive power of the ordinary "Mogul" freight engine; or, as we may express it in another way, the net load in tons per ton of traction, or per five tons on the drivers. From this column we can readily determine the effect on the net load of any changes of grade, as follows:

We see by the fifth column that one ton of tractive power will haul 190 tons of net load on a level, and only 69.5 tons on a 40-feet grade. It evidently follows that the engine tonnage required for a given business, with a 40-feet ruling grade, will be

$$\frac{190.}{69.5} = 2.73$$

times that which would be necessary on a level grade; that is to say, it will be increased 173 per cent. In the same way, if we wish to determine the effect of various changes in a 60-feet grade have:

For an *increase* in rate of grade of	*I. e.*, from 60 ft. per mile to	Formula for *increase* in engine tonnage: with data from Tab. XVII.	Equal to a total increase of	Or, to an *average increase per ft.* of
10 feet per mile.	70 ft. per mile.	$\frac{51.1}{48.8} = 1.14$	14 per cent.	1.4 per cent.
20 " "	80 " "	$\frac{51.1}{39.6} = 1.30$	30 "	1.5 "
40 " "	100 " "	$\frac{51.1}{31.8} = 1.61$	61 "	1.525 "
For a *decrease* in rate of grade of	*I. e.*, from 60 ft. per mile to	Formula for *decrease* in engine tonnage: with data from Tab. XVII.	Equal to a total decrease of	Or, to an *average decrease per ft.* of
10 ft. per mile.	50 ft. per mile.	$\frac{51.1}{59.1} = 0.86$	14 per cent.	1.4 per cent.
20 " "	40 " "	$\frac{51.1}{69.5} = 0.74$	26 "	1.3 "
40 " "	20 " "	$\frac{51.1}{103.8} = 0.49$	51 "	1.225 "

In this manner we may make out the following little table for different grades (Table XVIII.), which illustrates better than any formula the law of the change in the motive power required which results from any given change in any grade. An algebraic investigation and formula, showing the facts with the same correctness, would be so intricate as to be incomprehensible.

TABLE XVIII.

Showing the effect upon the engine tonnage required for a given business of various changes in various ruling grades.

Rate of ruling grade, in feet per mile.	Increase per cent. in engine tonnage resulting from an increase in the rate per mile of the ruling grade of—				Decrease per cent. in engine tonnage resulting from a decrease in the rate per mile of the ruling grade of—				Percentage per foot given in Table XIX.
	1 ft.	10 ft.	20 ft.	40 ft.	1 ft.	10 ft.	20 ft.	40 ft.	
Level.	4.0	40	82	173	.....	.....	.....	.....	4.0
30	2.0	20	40	86	2.0	20	39	.....	2·0
60	1.4	14	30	61	1.4	14	26	51	1.4
90	1.2	12	23	49	1.2	11	21	40	1.2
120	1.	10	20	42	1.	10	18	33	1.0
150	0.9	9	18	38	0.9	9	17	31	0.9

By examining Table XVIII. we find evidence of two facts:

First. *When the rate of any given ruling grade is increased or decreased, the corresponding percentage of increase or decrease in the engine tonnage required is very nearly uniform per foot, whatever the increase or decrease in rate,* slightly increasing, however, as the increase is greater and decreasing as the decrease is greater. For example, if a 30 feet ruling grade be increased to 40 feet per mile, the increase in engine tonnage required is 2.0 per cent. per foot; but if it be increased to 70 feet

TABLE D.

SHOWING THE PERCENTAGE OF INCREASE (OR DECREASE) IN THE ENGINE TONNAGE, PER FOOT ADDED TO (OR SUBTRACTED FROM) THE GRADE, WHICH RESULTS FROM A CHANGE IN THE RATE OF ANY GRADE.

Rate of maximum grade, in ft. per mile.	Per cent. of change in engine tonnage, per ft. of change in rate.	Rate of maximum grade, in ft. per mile.	Per cent. of change in engine tonnage per ft. of change in rate.
Level	4.0	70	1.4
5	3.4	80	1.2
10	3.1	90	1.2
15	2.7	100	1.1
20	2.4	110	1.1
25	2.2	120	1.0
30	2.0	130	1.0
40	1.7	140	0.9
50	1.5	150	0.9
60	1.4	over 150	0.8

REMARK.—This table is practically correct for any change in ruling grade, and also for any probable pattern of engine, ratio of adhesion and rolling friction. The following are the corrections for strict exactness:

For VERY CONSIDERABLE *changes in the rate of grade.*

For a change in rate of grade of	The per centage above should be increased about
40 feet per mile.	
50 " " "	8 per cent.
60 " " "	10 " "
	12 " "

For a different pattern of engine (or ratio of adhesion):

For a tank or "Fairlie" engine (or any engine weighing only 5 times its adhesion or tractive power; *subtract* 0.3 from each percentage.

For a "Consolidation" engine (or any engine weighing 8 times its tractive power) *subtract* 0.1 from each percentage.

For an "American standard" engine (or any engine weighing 12 times its tractive power) *add* 0.1 to each percentage.

For a different rolling friction:

Add to the per centage given above for a grade of	If rolling friction is assumed to be 8 lbs.	If rolling friction is assumed to be 12 lbs.
Level	1.0	—0.7
20 feet	0.3	—0.3
60 "	0.1	—0.1
100 "	0.0	—0.05

per mile, the increase per foot is 2.15 per cent., or about 8 per cent. (.15÷2.0) more per foot than for the smaller increase.

Second. *The* AMOUNT *of this percentage of increase or decrease in the engine tonnage required varies considerably with each grade, being nearly five times as much on a level as on a 150 feet grade.*

These two facts being definitely ascertained, we have, in order to determine finally the effect of any change of grade upon the engine tonnage required, simply to compute the average percentage per foot for a moderate change of grade, say 10 feet, and assume it to be constant for any increase or decrease in that grade however great, or at least provided it do not exceed 50 or 60 feet per mile. The percentage of error which results from so doing, as we may note without further demonstration than above, is about 10 per cent. for a change of ruling grade as great as 50 feet per mile and varies very nearly in proportion with the extent of the change, being 2 per cent. for a change of 10 feet per mile, 8 per cent. for a change of 40 feet, 12 per cent. for a change of 60 feet, etc. It is too small to be of any practical importance whatever for changes of 50 feet per mile or less, especially as it has the safe tendency of diminishing the apparent value of reducing the grade.

Table D, on preceding page, contains these percentages, for grades varying by a small amount; given in round figures and without that assumed precision which, in the writer's opinion, mars so many discussions of essentially uncertain problems. In order to show the substantial correctness of these percentages, under any reasonable variation in the premises assumed, we also give below Table D statistics showing the maximum effect of any such differences. These may be determined in precisely the same manner as the body of the table, but it would lead us too far to do so at length in the present paper.

[*To be continued.*]

THE UNITED STATES INTERNATIONAL EXHIBITION.

XI.

RAILROAD SIGNALS.

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To railroad men one of the most interesting and instructive portions of the Exhibition is the display of various systems of railroad signals. These may be divided into two classes: interlocking switches and signals for the movement of trains at and about stations, and signals for the open road, or "block" signals as they are now generally termed.

Of the former there are two systems exhibited, both in the English department, the one that of Messrs. Saxby & Farmer, and the other by Messrs. John Brierley & Sons, both firms of London. Each system is represented by a very complete working model showing the entire mechanism by which the switches and signals are operated. Besides these two systems, that of Messrs. Toucey & Buchanan, well known by their connection with the Hudson River Railroad, may be seen at work practically outside the Exhibition at the junction of the Pennsylvania Railroad with the circular track over which all trains arrive and depart from the Centennial station. The latter system was fully explained and illustrated in the *Railroad Gazette* of October 16, 1875, so that no further description is needed here, excepting to describe some improvements which have been made since then, and which will be referred to hereafter. As the number of the *Railroad Gazette* referred to may not be conveniently accessible to some of our readers, and as the interlocking system is not much known in this country, the description of the principles of its working will be repeated here.

It should be stated, first, that the object of the interlocking apparatus is "to prevent the signalmen from giving conflicting signals, and from moving their switches in one direction and placing their signals for another direction." It must be remembered, too, that there is no power in the hands of a locomotive runner to *direct* the movement of his engine. He is entirely dependent on the track which is prepared for him. He can start the locomotive either forward or backward, run fast or slow, or stop; but the locomotive runner is utterly powerless in directing its movement either to the right or the left, or to a straight line or curve. It is therefore of the utmost importance that he should know whether the track is ready for the locomotive and train to run on; whether it is clear or obstructed, or whether its continuity has been interrupted. For this knowledge he is in many cases absolutely dependent on the information communicated by others. The correctness of this information is, therefore, a matter of vital importance. A false signal may lead him and others into danger, or a misplaced switch dash them to destruction.

As an example of the use of interlocking switches and signals, we will take the simple case of a junction with a single switch, on an ordinary single-track road, as represented in plan by fig. 1. If an express train is approaching such a place, say from the right, or the direction indicated by the dart, with the intention of running past at a high rate of speed, some disaster would necessarily occur if there were a train on the branch, and the switch which the train was approaching were set for the branch, while a signal indicated that the main line was "clear." Such accidents have been and are still of frequent occurrence. To prevent them, ordinarily, the rod which operates the switch rails is connected with a signal—a target by day and a colored light by night—so that whenever the switch is opened to the side-track a danger signal is displayed to approaching trains. This device has the germ of the system of interlocking switches and signals.

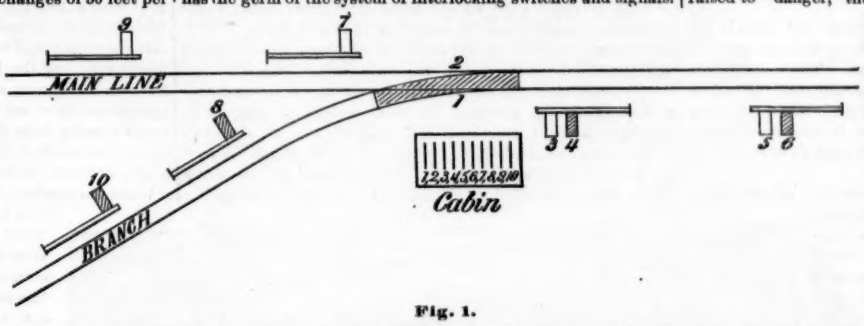

Fig. 1.

In order to explain more fully the principle on which the interlocking system operates, we will suppose that the switch in fig. 1 is operated by a lever, the mechanism of which will be described hereafter, located in a signal box or cabin (shown in the plan) placed alongside the track. In the operation of ordinary switches there is always danger that the switch rails may be only partly moved from one line to the other, or, to use the common term, may not be moved "home," or that they may be displaced after they are first set. If they are only partly moved, the flanges of the wheels are liable to strike the ends of the rails, and thus either the cars may be thrown from the track, or a portion of the train be run in one direction and a portion in another. For this reason, it has been found that it is not only necessary to be sure that the switches are moved, but also that the rails are locked in their proper position after they are moved. This contingency is provided for in Messrs. Saxby & Farmer's apparatus, by their "patent facing-point lock," which is represented in fig. 2.* It consists of a cross rod, *c*, which connects the two switch rails near their movable ends; and in this rod are two holes, so that the switch may be locked for either position. A bolt, *B*, shoots into one or the other of these holes, thus holding the switch rails in their proper position. If the switch rails are not moved home, the bolt will not enter either of the holes, and the switch lever by which the bolt is worked cannot be thrown the full distance of its travel. It will be seen then that not only must the switch be moved, but it must be moved *home*, and should be locked in that position *before* a signal is given to permit a train to pass over it. For this reason the switch signal is not connected with the switch rails, but is worked by an independent lever also located in the cabin. Instead of ordinary switch targets, what are called semaphore signals, which are much more conspicuous than the former, are used by Messrs. Saxby & Farmer's and other interlocking systems for switch signals.

FIG. 2

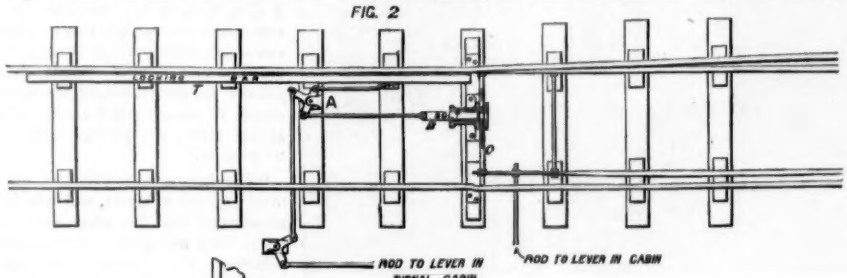

FIG. 3

FIG. 4

A semaphore signal consists of an arm, *A*, fig. 5, attached to a post by a pivot or shaft, *B*, so that it can be raised into the position shown, or lowered so as to stand at an angle of 45 degrees to the post. When the semaphore arm stands at right angles to the post, or in the position represented in the engraving, it signifies "danger," and when inclined at an angle of forty-five degrees it expresses "safety," "all right" or "line clear." The posts to which the semaphores are attached are usually made from twenty to thirty feet high, but they are sometimes made of much greater height in locations where it is necessary in order to make the signals conspicuous.

The semaphore arm is raised by a rod, *C D*, which is connected at its upper end to a crank, *C*, which is attached to the shaft *B*, and at its lower end to a weighted lever, *D W*. The latter is connected by means of a wire rope, represented by the dotted line *E*, to a lever in the cabin. The lever *D W* has a counterweight *W* on the end, arranged so that if the wire rope *E* or its connections should break, the counterweight would throw the arm to the horizontal position indicating "danger," and thus stop the trains in case of accident to the signaling apparatus. If the semaphore were arranged so that in case of accident it would fall to safety, then in such an event a locomotive runner might be induced to advance while the switch was set wrong or when there was some obstruction in his way on the track; but by arranging it so as to indicate danger in case of a breakage, the worst that can happen in such an event is delay or to stop the trains. On the opposite side of the signal post from the semaphore arm a lamp, *L*, is placed to be used as a signal at night.

The shaft *B* to which the semaphore is attached has an arm, *C*, called a spectacle frame, with two openings, the one containing a red glass, *r*, represented by diagonal lines, and the other a green glass, *g*, shown by vertical lines. When the signal is raised to "danger," the red glass comes in front of the opening to the lamp, so that the light shows red; and when the semaphore is lowered the green glass is raised up and the lamp shows a green light. Two different colored lights are used so that the signals for both "danger" and "safety" will be positive, so that in case of accident, such as the breakage of the glass, the lamp will show a white light, which will indicate that something is wrong. Besides, if white lights are used as signals, there is danger of mistaking the lights in houses and elsewhere for signals. For the same reason the semaphores should not be lowered into a vertical position so as to be hid by the signal post, because then if the semaphore was blown down, or other accident occurred, its absence would be regarded as an indication of "safety." If instead the semaphore is placed at an angle of 45 degrees to indicate "all right," the signal is positive and the absence of the semaphore would show that something was wrong.

Semaphore signals have been found so superior to all other types that in Europe they are rapidly superseding all others, and before long they will probably be the only daylight signals used. Of course, more than one semaphore may be used on a post where they are needed. They should, however, always be placed so as to appear on the left-hand side of the post from the train whose movements they are to direct, so that they may not be confused with the signals which are intended for the trains running in the opposite direction.

Referring again to the plan of a single line junction, fig. 1, as has been explained, if the switch is set for the main line and the signal is given that the branch line is clear, or *vice versa*, or if the switch is moved and not locked, an accident might occur.

The object of the interlocking apparatus is to provide such mechanical appliances as will make accidents from such causes absolutely impossible, and in order to do this and also to save labor and time by making it unnecessary for signal and switchmen to go from one switch or signal to another each time it is to be changed, the switches and signals are operated by levers which are all gathered together inside of a small building or "signal box," fig. 6, as it is called, elevated sufficiently to give a good view of the track. Such a cluster of levers is represented in the perspective view, fig. 7. Part of the floor of the signal-box is shown on the left-hand side, from which it will be seen that the upper part of the levers is above the floor—in the second story usually—and the lower portion below.

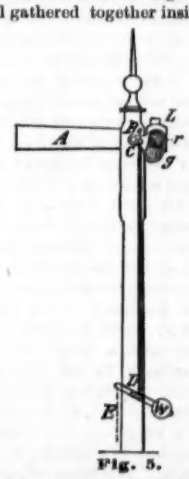

Fig. 5.

Fig. 6 represents the "signal-box" or cabin erected by the Pennsylvania Railroad Company for the levers of the Saxby & Farmer signals at East Newark. It may be mentioned incidentally that the design is a very neat one and worthy of imitation.

From what has been said it will be seen that in order to prevent accidents at switches it is necessary that the levers which operate the switches and signals should be moved in a certain order or relation to each other. To illustrate this, let us suppose that the lever which moves the switch in fig. 1 is numbered 1, the switch-lock lever No. 2, the main-line up signal lever No. 3, and the branch up signal lever No. 4. Suppose that the switch was set for the main-line, the main-line signal set to safety, and the branch signal to danger. Now if a train was approaching from the right for the branch and the switch was moved without altering the main line signal, a train might approach on the main line from either direction, and as the signal indi-

* It is only what are called "facing points" that require to be locked. "Facing points" are what are called here split switches, which are so located that trains run over them from the points of the switch rails towards the heel. When trains run over such switches in the opposite direction, they are called "trailing points," and it is then not necessary to lock them as the wheels of the trains will force them into the right position if they are set wrong.

cated safety it might keep on and be thrown off by the switch. It is therefore evident that before altering the switch from the main line to the branch, lever 3 should be moved so as to set the main signal to danger. If this is done, and the branch line signals should be lowered to indicate safety *before* the switch is moved and locked, the train for the branch might advance before these latter operations were fully accomplished, and thus be thrown from the track. It is therefore evident that in order to secure safety the switch signal should not be lowered to indicate safety until *after* the switch is moved and locked. The order of operation of changing the switch and signals from the main line to the branch is as follows: First, set the main-line signal to danger; second, unlock the switch; third, move the switch; fourth, lock it; fifth, lower the branch-line signal to safety. Or, if we arrange the numbers of the levers in the order in which they should be moved, they would be as follows: 3, 2, 1, 2, 4. In moving the switch back again, just the reverse order, or 4, 2, 1, 2, 3, would be the only way to avoid any risk of accident.

It has been explained that the switches and signals are operated by levers which are placed side by side in a cabin or "signal-box," as it is called in England. These levers are connected with the switches by rods—usually made of 1¼ in. gas pipe—and with the signals by wire rope. When the direction of the rods is changed, a bell crank is interposed at the angle and the wire ropes run over suitable pulleys to lead them to their destination.

Fig. 8 represents a side and fig. 9 a front view of one of the levers for working the switches or signals, which is similar to the reverse lever of a locomotive. It is pivoted at *P* and has a throw from *b* to *c*. The rod *R* communicates with the switch or switch lock. The lever is provided with a spring latch or "catch rod," *k l*, which engages in two notches, *l* and *g*, in quadrants, *A*—similar to those used with locomotive reverse levers—between which the lever works.

Fig. 10 represents a side view of two such levers with the locking attachments, and figs. 11 and 12 two detached views of part of the interlocking apparatus.

One of the chief peculiarities of Messrs. Saxby & Farmer's interlocking apparatus is the rocker-link, *D D*, fig. 10, which is similar in form to the link of a locomotive valve gear. It is located on one side of the lever and quadrant as shown in figs. 9 and 10.* It is pivoted at *A*, fig. 10. A stud, *l*, figs. 8 and 9, in the catch-rod projects sideways and engages in the block *B*, fig. 10, which slides in the slot in the rocker-link. The lever *C* is represented with the catch-rod withdrawn from the notch in the quadrant, in which case the slot in the link is concentric with a circle described from the pivot *P* about which the lever moves, so that the block *B* can move from end to end of the slot without moving the rocker. When the lever is thrown forward in the position represented by the further lever in the engraving, and the catch-rod is down in the notch, the stud carries the block and the end of the rocker link down with it, so as to occupy the position in which the farther rocker-link in the engraving is represented. "As the spring catch-rod can fall only into the notches at each end of the quadrant, it follows that the rocker-link is not moved during the stroke of the lever, because the stud when the lever is moved only travels in a slot which is concentric to the centre on which the lever itself moves. As the movement of the spring catch-rod works the locking, the locks are consequently put in or are taken off at each end of the stroke of the lever when the spring catch is raised out of or allowed to fall into the notch in the quadrant."† This it will be shown hereafter is an important advantage and a great aid in insuring absolute safety. At the left-hand end of the rocker-link, fig. 10, is a jaw to which a link, *E*, is connected by a universal joint. At its upper end this link is in turn connected to a small crank, *c*, shown in end view in fig. 11, which is attached to a spindle, the bearings of which are shown at *C*, *C*, fig. 10. The intermediate portions of these spindles between the bearings are flat, and are shown edgewise at *H* and flatwise at *I*, the two parts being represented as being broken apart. In fig. 11 they are shown in cross section at *M* and *N* and also behind the crank. Fig. 13 represents top and side views of one of these spindles.

The left hand spindle, fig. 10, has a lug on top which has a stud which engages into a notch in the under side of a small casting, *K*, which is attached to a bar, called a locking bar. The motion of the crank thus obviously gives a lateral movement to the bar, and when the rocker is raised up by the catch-rod the crank spindle and bar will occupy the position represented in fig. 12. A number of these locking bars, fig. 10, are laid side by side above the spindles, and in order to save space a similar number are placed below the spindles. To these locking bars small castings, *L*, *L*, fig. 11, called locks, are attached. Now it is obvious that so long as the spindles *M* and *N* are in the position represented, the bar is free to be moved laterally, in the direction of the arrow, by the crank. But it will be noticed that when the locking bar is in the position represented, the spindle *M* is free to move into either of the positions represented by the dotted lines, while the spindle *N* is locked by the lock *L'*. As each rocker-link is attached to a spindle, the latter may occupy one of three positions. These are shown at *M*: 1st, the normal or horizontal position, shown in full lines; 2d, an intermediate position, when the main lever is being moved, as shown by dotted lines; and 3d, the third position (also shown by dotted lines) is that which the spindle occupies when the main lever has been pulled over and the spring catch released. The right-hand end of the rocker-link is then depressed, and the other end with its link and the crank is raised, as shown at *O*, in fig. 12. The spindle *M* is now locked and *N* is unlocked. If the link *O* and its spindle had been moved only to the second position, then *M* would have been locked, but the lock *N* would not have been moved far enough to release the spindle *N*. It will thus be seen that the third position of the rocker and spindle plays a very important part in the locking, because until that position is fully attained some of the locks are not released. If, for instance, a spindle stands locked, as shown at *N*, fig. 12, it is not released until by the movement of another spindle into the third position, shown at *O*, the lock on the locking bar has traveled sufficiently in the direction of the arrow to stand over a hole in the flat spindle *N*, in which case the spindle can be turned up in front of the projecting beak of the lock, as shown in the case of the right-hand spindle *N*. The spindle *N* now prevents the return movement of the lock, and of the crank which being connected by the link *O* to the rocker, the spring catch cannot be raised out of its notch, and therefore the lever to which it is attached is said to be "back locked" and cannot be moved until the flat spindle *N* has been replaced in its first or horizontal position. To do this its lever must be moved forward and its spring catch-rod be lowered into the forward notch of the quadrant or sector. It will be seen, then, that by locating the locks on the locking bars in the proper relation to the spindles, it is possible to make any lever either lock or back-lock any one or more of the others, so that the locks can be arranged in such a way as to make any combination or order in the movement of the levers possible.

One of the great advantages possessed by the apparatus of Messrs. Saxby & Farmer which we are describing is that each lever must complete its movement before it can either lock or unlock any other levers, and the act of locking or unlocking, that is, the movement of the spring catch, either secures or releases the lever. If it were the movement of the lever which actuated the locking apparatus, then there would always be danger that the levers would not be moved home. Thus in moving a switch the lever might be moved and not fastened in its proper position by the spring-catch. With Messrs. Saxby & Farmer's apparatus, if this is done the switch-lock lever would not be unlocked, as it is the movement of the spring catch-rod which secures the switch lever that *unlocks* the switch-locking lever. Then, too, the latter must be moved home and fastened in that position *before* the home signal lever is unlocked. It will thus be seen that this mechanism makes it absolutely necessary not only that each lever should be moved in its proper order, but that each movement must be *completed* and the lever then secured in its position *before* the next movement can be made. The signalman is thus not able "even to commence to make any movement of either switches or signals that have any relation to the movement which he intends to make; and * until he has thoroughly completed the intended movement, and has ceased to meddle with the part of the apparatus which actually sets the switches or signals in motion, all switches or signals affecting the operation which he is performing must be securely locked."

Another advantage which it possesses is that the only strain to which the locking apparatus can be subjected is that which is exerted by the operator's hand in the spring latch of the levers, as the locking is entirely independent of, and either precedes or follows, the movement of the levers.

At a single line junction like that represented in fig. 1, where the trains run in both directions on the track, there must be two sets of signals at the switch, the one to direct the movement of the up and the other for the down trains. Thus, if at such a junction there were only the signals 3 and 4, the first for the main track and the other for the branch, if the latter were lowered so as to indicate "line clear," an up train might approach the junction at the same time with a down train on the branch, and there would thus be a collision. For this reason there are two sets of signals: one, 3 and 4, for the trains running from right to left, which will be called "up" trains; and another set, 7 and 8, for those running in the opposite direction, or the "down" trains.

When the number, weight and speed of trains are very great, it is found that a signal at the place of danger alone does not give sufficient time or space after it can first be seen to check a train with certainty before that place is reached. For this reason, what are called "distant signals," 5, 6, 9 and 10, fig. 1, which consist of semaphores, the same as those described and illustrated, are placed at about 1,000 to 2,000 feet beyond the switch or place of danger. These are also operated by levers in the cabin, which are connected with the semaphores by wire or wire rope. In changing the switch, then, the first thing to do is to set the distant signal to danger; and it should not be lowered until *after* the movements of the switch and of the signal near it, which is called the home signal, are all completed. Supposing the switch to be set for the main line, and all the signals at danger—in which condition they should always be left after a train has passed—and that an up train is to run from the main line to the branch, the first thing to do is to unlock the switch, then move it to the branch, then lock it, then lower the home signal 4, and then the distant signal 6. The order of the movement of the levers would thus be 1, 2, 1, 4, 6. If the train was to run from the branch to the main line, signals 8 and 10 would be lowered instead of 4 and 6. If after an up train had passed to the branch a down main line train was to pass, the signals 6 and 4 would be raised to "danger," the switch would then be changed to the main line, and signals 7 and 9 be lowered to line clear. The movement of the levers would therefore be in the following order: 6, 4, 2, 1, 2, 7, 9. The order in which they must be moved for any other trains the reader can easily work out for himself if he will remember that danger signals should always *precede* the movements of the switch or other causes of danger, and safety signals should always follow any change which makes the "line clear."

"The interlocking principle can be applied to any system of levers, and any lever can be interlocked with any other lever irrespectively of the work which each particular lever has to perform. Thus signal levers can interlock with signal levers or switch levers, and switch levers can interlock with switch levers as well as with signal levers. This latter arrangement is occasionally of much consequence, as it is often desirable that a series of switches should not be allowed to be put into one position, and a particular path so "made" for a train to pass in one direction, unless another series of switches be arranged, and a second path "made" in such a way that vehicles running along it, or trains which might overrun or disobey the signals, might be prevented from entering on or crossing the path of a train passing, in obedience to signals, along the first-mentioned path."

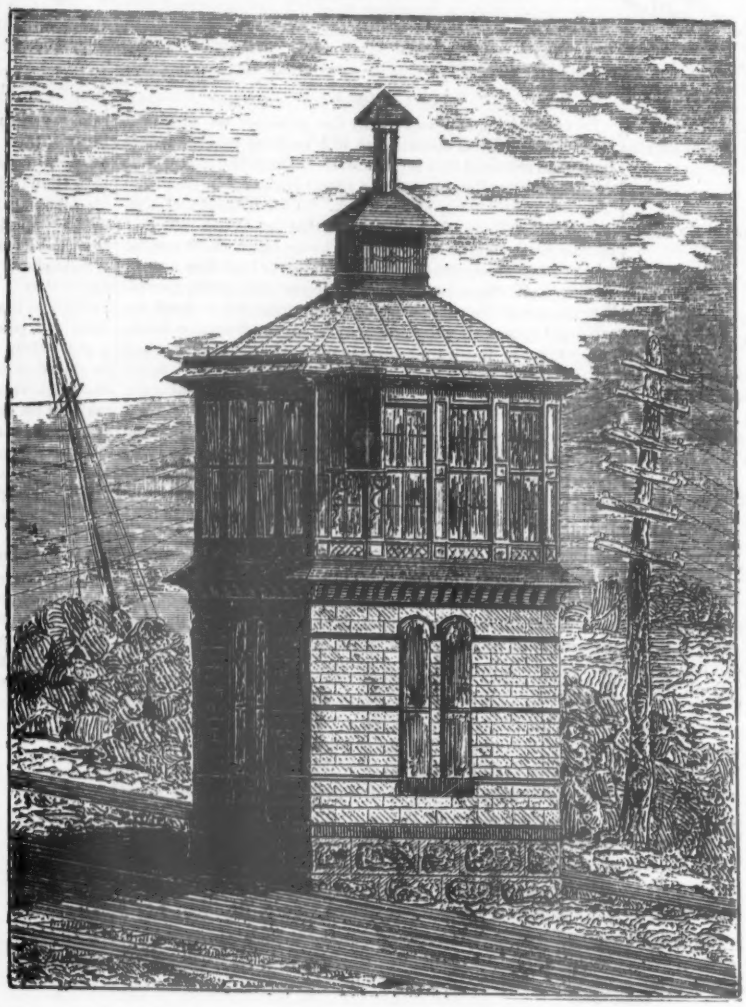

Fig. 6—SIGNAL-BOX ON PENNSYLVANIA RAILROAD AT EAST NEWARK.

* In fig. 8 the quadrant is represented with the rocker-link.

†For the preceding and also some of the following description in quotation marks, and also for engravings figs. 2-4 and 10-12, we are indebted to Mr. John Wolfe Barry's very excellent little book on "Railway Appliances."

Brattleboro & Lake Champlain.

It is proposed to build a narrow-gauge road from Brattleboro, Vt., northwest to Whitehall, N. Y. The line proposed is from Brattleboro up West River to Jamaica, then across the Green Mountains to Winhall and through Manchester and Pawlet to Whitehall. The distance is about 80 miles, and it is said that the road can be built for $15,000 per mile. A preliminary reconnoissance of the line has been made by Mr. Robert E. O'Brien, of New York, an engineer, and Mr. B. D. Harris, of Brattleboro, a well-known contractor, and they say that the line is feasible and that no very heavy grades will be required.

Levis & Kennebec.

This road has been extended from Scott Junction, P. Q., southward 15 miles, making 45 miles now in operation. The new section was formally opened for travel last week.

Stratford & Huron.

At the annual meeting in Stratford, Ont., recently, the directors reported that provincial and local aid had been subscribed to the amount of $273,850. Work had been delayed by the refusal of the Perth County Council to issue $80,000 bonds voted, and a law suit to compel the issue had been begun.

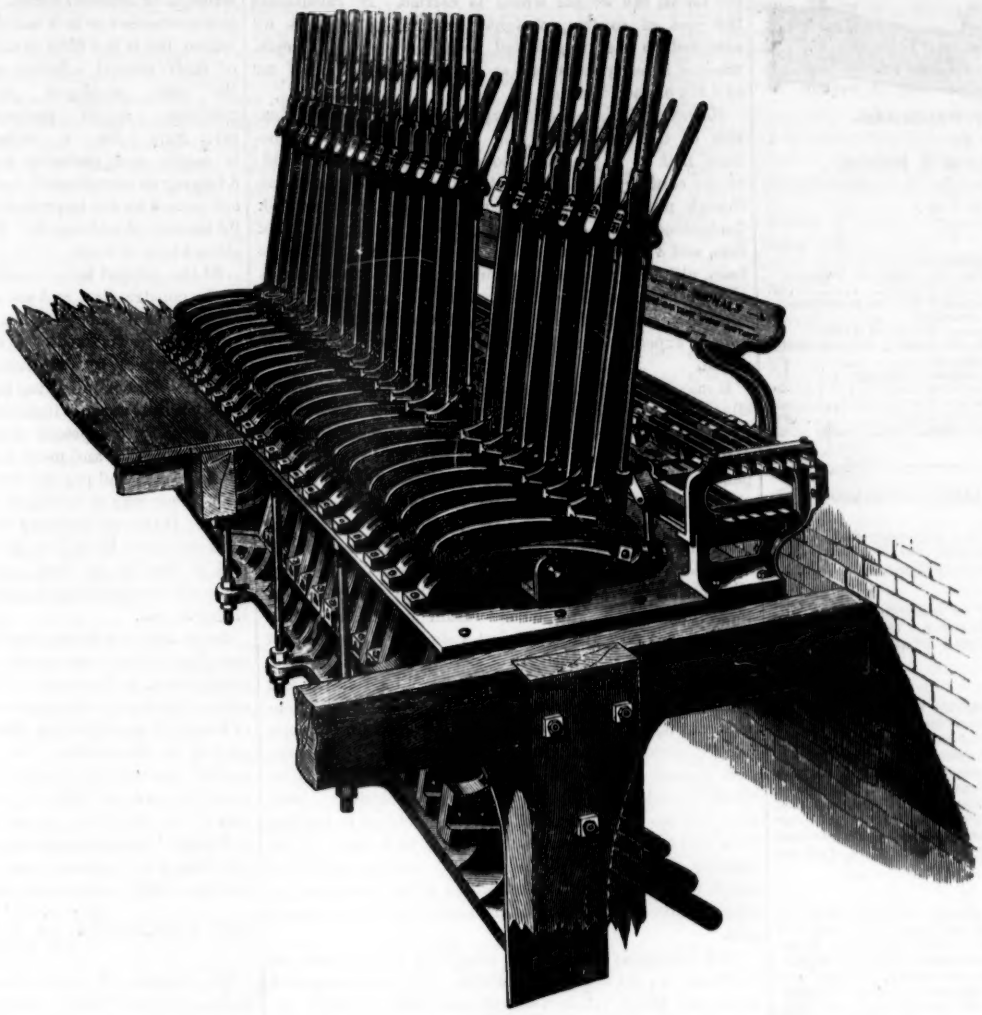

Fig. 7.

Fig. 8.

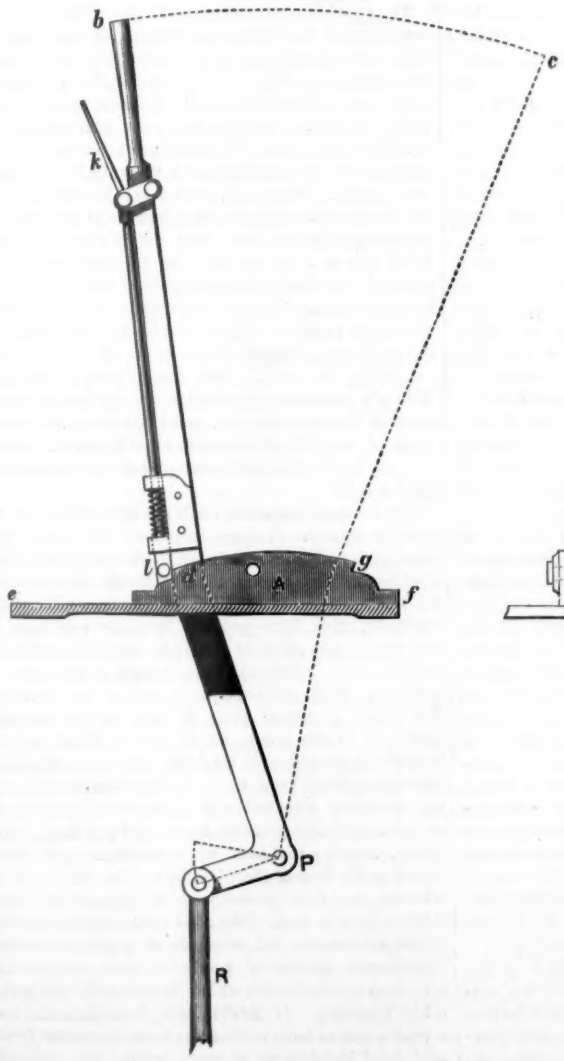

Fig. 9.

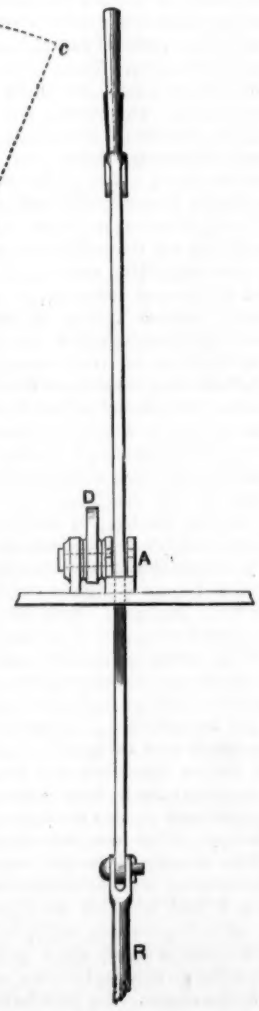

Fig. 10.

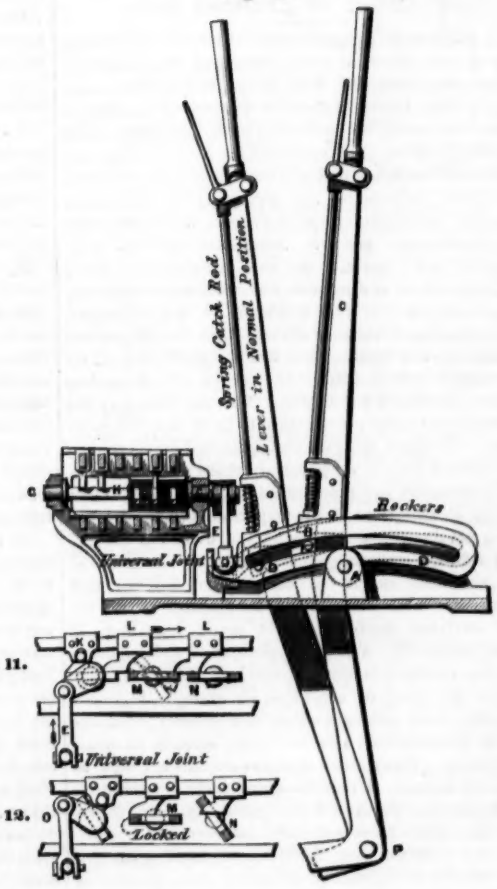

Fig. 11.

Fig. 12.

Fig. 13.

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Editorial Announcements.

Passes.—*All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.*

Addresses.—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

DEAD WEIGHT OF RAILROAD CARS.

Every unfortunate dyspeptic knows that there are certain articles of food, which, if eaten, instead of being digested and thus increasing the vital forces, apparently remain inert, and thus become a burden instead of a source of strength. An analogous condition of things often exists in mental processes. A subject will be presented for consideration and solution, and will be eagerly taken up, and, from outward indications, will apparently be undergoing a process of assimilation, until by a sort of general sense of oppressiveness and a recurrence of the subject again and again, in an interrogative form, which, instead of calling out any wholesome response, only produces a sort of dull sensation of oppression and perhaps loathing, it becomes evident that the subject has not undergone any change, but, like indigestible food, we have it always with us until it becomes a sort of incubus instead of affording nourishment. Now the subject of the dead weight of railroad cars seems to be of this indigestible kind. It comes up again and again and seems to produce a sort of mental dyspepsia in those who discuss it. Railroad reformers and experienced railroad officers alike are prone to assign to it an importance which it probably does not deserve, and many of the evils and misfortunes of railroad mismanagement are apt to be attributed to the excessive weight of cars. The fact is, and it might as well be fairly recognized, that the cost of carrying dead weight is much less than is ordinarily supposed. A large proportion of the expenses of operating railroads is not influenced at all by it. Its effect upon the decay of cross-ties, for example, is probably inappreciable; station service and general office expenses are not increased a dollar by the amount of dead weight carried. Many other expenses are affected only to a very slight degree. A very common error is to assume that as it costs, say the New York Central Railroad, three-quarters of a cent per ton per mile for carrying freight, therefore for every ton that the dead-weight of a car can be diminished a saving will be effected of three-quarters of a cent for each mile the car runs. The fact is, however, that it costs three-quarters of a cent per ton per mile not for carrying the freight alone, but for carrying the freight *and* the weight of the cars on which it is loaded. The latter will average at least 1½ tons to each ton of freight carried, so that really it costs three-quarters of a cent to carry a load of 2½ tons a mile, or only about three-tenths of a cent per ton for all the weight which is carried. In calculating the cost of carrying freight the total expense is all assigned to the freight and none to the weight of cars, whereas it really costs just as much to carry a ton of car as a ton of merchandise.

However, it is not our purpose to go into an investigation of the cost of carrying dead weight, nor do we believe that it is profitable to carry useless dead weight; on the contrary, it is attended with constant expense, although not nearly so great as is ordinarily supposed. Undoubtedly it is desirable to reduce the dead weight of cars, and a certain amount of saving would result therefrom, although not nearly so much as many too sanguine, and, perhaps, too little informed people think. What we want to point out here is the way in which it may reasonably be expected that the dead weight of cars can be reduced.

It may be stated, in the first place, that there is not the slightest reason for supposing that it will or can be done by any sort of mechanical hocus-pocus. It will not be by any "inspirational" method, but by some clear-headed person who will learn all about the subject which experience can teach him, and who will then learn as much more as he can by patient research, He will then, and not until then, be in a position to employ whatever scientific knowledge he can bring to bear on the subject.

Reducing dead weight is something like reducing personal expenses. The consideration of the aggregate amount does very little good, but a study of the details of a carefully kept cash account is, perhaps, one of the most wholesome researches into our own personal follies and our unguarded lapses from wisdom in which we can engage. It is, at least, hopeful of good results, but mere self-reproach, no matter how contrite it may be, over the sum of expenses and the minus transactions in our bank accounts leads to little excepting good resolutions. Now to reduce the dead weight of cars we should go to work as we would to reduce expenses: we must first find out accurately the details of the weight and dispense with that which is useless, diminish that which is too great, and reconstruct those things which are made on wrong principles.

Very frequently young men employed on railroads are ambitious to do some work which will have some real value, and which will be a sort of indication of their capacity for doing what is really useful, or in other words, to make themselves favorably known. Now, if among our readers there are any such, we will say that if they will only go to work and get the weight carefully and in complete detail of one or more classes of cars, they will be doing what will be extremely useful, and which would be an indication of their capacity to do work which is practically valuable. No unusual ability is needed, no scientific knowledge greater than that which is necessary to read the weights of castings and other parts of cars on a scale beam, and to write clearly and legibly. There is no contribution to our pages which we would more gladly publish than such records of weights. They should, however, be *accurate* and *explicit*, the importance of which young men are apt not to regard sufficiently. There should, for example, be no room left for doubt, if the weight of a set of journal boxes was given, in knowing whether it meant four boxes for one truck or eight boxes for a whole car.

By collecting together in this way the weights of a number of cars, and then comparing them, we would in all probability discover that the parts of some cars are very much heavier than those of others. This would lead to investigation of the causes and the adoption of the lightest which experience indicated to be strong enough to answer the purpose. Probably most car-builders would be surprised when they learned the amount of weight in a complete set of passenger car seats, and other old patterns which have done duty for many years would be found to be a kind of multiplication table which duplicates a certain amount of useless material each time it is used.

In the construction of iron bridges, in which the amount of material and money saved in each structure if it is skillfully designed compared with the cost if no special skill is employed is large, the highest order of engineering ability has been employed. Both science and practical experience have been united to secure the best possible results. All the strains to which the various parts are subjected have been carefully investigated, and the qualities of the materials used are subjected to the most rigid tests; and yet the strains on a bridge are simple compared to those which must be borne by a railroad car. It is true that one car costs much less than a bridge, but the car is duplicated hundreds or thousands of times, so that the aggregate cost is very much greater than the aggregate of bridges. What is needed, then, is a careful investigation of the elements of strength in such parts of cars as the frames, axles, draw-bar attachments, trucks, &c. There is here a field in which the highest mathematical knowledge might be profitably employed.

There is, however, another sort of ability which probably, more than any other, could be exercised on this subject of the design and weight of cars. We refer to that sort of mechanical instinct which comes from long practical experience in designing work and calculating the strength of different forms. It is hard to describe this. It is not science nor is it merely the result of practical observation, but it is a kind of union of the two, or a knowledge of their mutual relation and also of the limitations of the arts employed in car-building. A mathematician might perhaps calculate the strongest form for a railroad car draw-bar, but it might and probably would involve the making of a forging so complicated and expensive that the advantage gained by the improved form would be entirely offset by the cost of making it. The same thing is true of all other kinds of work.

At the present time considerable attention is directed to the construction and use of iron cars. Several firms are considering the question of engaging in their manufacture. Now the success or failure of iron cars will depend almost entirely upon the success with which they are designed. Parties intending to go into the business will act wisely if they make it their chief aim to find an experienced and entirely competent draftsman to design such cars, and, in this first and most important step, fling economy to the winds, and pay for the designs whatever a competent person may or would be likely to demand for making them. If this preliminary work is done badly its evil effects can never be shaken off without making a fresh start; and if done in the best possible way, it will furnish a passport to success which is certainly worth whatever it is likely to cost.

As we stated at the beginning of this article, the cost of carrying a given amount of dead weight has been much exaggerated, and perhaps it has been because the whole subject has been looked upon and studied through a sort of distorted mental vision that more has not been accomplished in diminishing the useless weight. What is needed, and what it is hoped will be given to the subject, when iron cars are built, is patient and careful investigation of the subject by persons whose practical experience and mathematical knowledge will qualify them to do all that theory and practice can in producing the strongest structure with the least material.

THE DISPOSITION OF A BANKRUPT RAILROAD—AN EXAMPLE.

The purchase of the St. Louis, Rock Island & Chicago Railroad by the Chicago, Burlington & Quincy Company was consummated on Friday, the 6th inst., by the payment by the latter company of the entire purchase price—$1,570,000 gold—to be transmitted to Frankfort to the German proprietors of the road—that is, the portion of the bondholders who joined in the purchase at the foreclosure sale, representing, we believe, about $5,000,000 out of the $9,000,000 of bonds.

The purchase was really a simple affair, owing to the condition of the company selling. It was organized to receive the property from Mr. Osterberg, the agent of the purchasing bondholders; but the stock, we believe, had not yet been distributed to the bondholders, but was held in trust by Mr. Osterberg, the agent, who was authorized to sell the property. Three different mortgages had been made by the new company, but under only one had bonds been issued. When Mr. Osterberg bid in the road last fall for the associated bondholders for $1,320,000, a larger amount was due in cash than the bondholders had provided, and in order to complete the payment the bondholders' committee borrowed $250,000 of a Frankfort banking house. This was made a first charge on the road. The other proposed issues were to be distributed among the purchasing bondholders, and sold to raise money for improving the road. Now the Chicago, Burlington & Quincy's purchase consisted in buying the entire capital stock of the new company, and contracting for the retirement of the $250,000 of bonds already issued, leaving the road wholly in the purchaser's hands, without a dollar of funded debt.

The German proprietors will use $250,000 of the money received from the property to pay off the debt heretofore described, and the remainder, $1,320,000 gold, can probably be divided among them without much diminution for other accumulated expenses. As they paid $1,320,000 currency, they have profited by their purchase at the foreclosure sale (if it is proper to speak of profit in connection with Rockford, Rock Island & St. Louis bondholders). Still, divided equally among the bondholders, the entire purchase price is only at the rate of $175 gold per $1,000 bond, which is not much more than half of the accumulated interest, while considerable contributions have been made by the bondholders besides the borrowed $250,000 which they now have to repay, in connection with the foreclosure and purchase. On the whole, the bondholders, we understand, get about an eighth of the face of their bonds, or less than two years' interest, and they probably think themselves fortunate to have done so well. The road needed some new capital for improvements, and after all it could not secure any considerable amount of profitable traffic without the co-operation of roads with which it naturally competed for other business. It would have been difficult for any management to have worked the road satisfactorily so long as it stood isolated, as it were, lacking the connections

needed for its traffic, and it was especially difficult for a company wholly of Europeans.

The cost of this road to the Chicago, Burlington & Quincy Company is about $1,750,000 currency. For this amount it obtains 272 miles of railroad, which is substantially in three different parts, and probably enough will be so worked. First there is the line from the Chicago & Northwestern near Sterling southwest to Rock Island (41 miles owned) with a short spur to a coal mine; then the long line from a point on the Chicago, Rock Island & Pacific road 12 miles east of Rock Island southward 207 miles to Alton, with running rights thence to East St. Louis (21 miles further); and finally, one of the most useless lines ever built, from the Chicago, Burlington & Quincy at a point nine miles east of Burlington northward 18 miles parallel with and a little east of the Mississippi to Keithsburg, there connecting with the Galva & New Boston line of the last-named road. Trains have been run through between Sterling and St. Louis, but we believe that the company does not own an entrance into Rock Island from either direction, using the Weston Union track on one side and that of the Chicago, Rock Island & Pacific on the other. Altogether there is, we believe, just 270 miles of road owned by that company and 295 worked by it. Thus, counting the currency cost at $1,750,000, the Chicago, Burlington & Quincy gets its new property at the rate of less than $6,500 per mile of road, equipped and in operation—which is certainly a very low price. It ought not to be difficult for this company, which can use the new line to St. Louis advantageously for traffic coming from the other 1,300 miles of its railroad, to make a profit on this investment, and on the additional amount which doubtless will be required to put the road into thoroughly good condition.

The purchasing company has not yet increased its capital account by the purchase of this road. The sum required was borrowed for the purpose, and is therefore, for the present, an increase of the floating debt. This debt will doubtless be retired by a new issue of bonds, which will probably be made large enough to cover the expenditures needed to put the road in order. Probably about $7,500 per mile will cover the whole cost, and at 7 per cent. the yearly interest charge would be $525 per mile. The average net earnings per mile of the lines of the new proprietor in 1875 was $4,230. Thus it will only require profits *one-eighth* as great as the average of the other lines of the company to justify the purchase, which, moreover, was desirable to prevent losses on the other lines, aside from its direct returns.

The Chicago, Burlington & Quincy Company now works and virtually owns about 1,570 miles of new railroad. This makes this company the second in extent of those west of Chicago, taking the place of the Chicago, Milwaukee & St. Paul, which has heretofore stood second to the Chicago & Northwestern. From Clinton on the north to St. Louis on the south it has a station in nearly every Mississippi River town of importance (and in several quite unimportant ones). Clinton, Rock Island, New Boston, Burlington, Keokuk, Quincy, Hannibal and St. Louis may all reach Chicago and the East over its lines. It has a St. Louis-Omaha as well as a Chicago-Omaha line, of about equal length and both comparing favorably with any others between the same places. The entire district between the Illinois and the Mississippi rivers south of the Chicago & Northwestern is pretty thoroughly cut up by its numerous lines, and it is to these that the St. Louis, Rock Island & Chicago road in the hands of an independent company was able to do considerable injury.

As we have said before, this transaction is an example of the disposition of a bankrupt railroad likely to be followed in many other cases, and altogether desirable. The question is no longer whether these roads ought to have been built; but, now that they are built and have disappointed the expectations of their proprietors, what shall be done with them. In most cases they can be worked to greatest advantage by some solvent company as a part of its system, instead of being an independent road. But hitherto solvent companies have seemed reluctant to buy such roads at any price, while the owners, forming their idea of their value from what they cost or the amount of bonds issued on them rather than from their net income, have been unwilling to accept reasonable offers. But it should not be necessary to point out that while the Rockford, Rock Island & St. Louis Railroad nearly ruined those who put $9,000,000 into it, it may well be profitable to those who get it for less than $2,000,000. The fact that a road has been bankrupted tends to make investors shy of it, as if it were its nature to bring misfortune. They seem slow to apprehend that so long as a road earns anything more than its expenses it is worth something; that a poor road which makes no return to its proprietors may do great injury to the business of a competing road; and that in this case the owners of the competing road can make more out of the bankrupt line than it is worth to anyone else. We shall probably always suffer from the unwise location and distribution of our railroads, since a much more efficient system might have been formed with much less expenditure both for construction and operation. That is, better facilities could have been afforded to the community by a well-planned system which would have a very much smaller mileage; and what is probably still more important, the working of the well-planned system would have been very much less expensive than that of the roads which we actually have. But that is a matter which we may regret but cannot remedy. These roads exist: the question now is, to make the best use of them. They were not built as systems or parts of systems, which is a pity, but it remains possible to form systems out of them, and for the most part they never can be worked to advantage — to the advantage of the community as well as of the whole body of railroad proprietors—until they are formed into systems. The stockholders of solvent companies have been prejudiced against the "policy of expansion" because of the unfortunate results of most of the numerous extensions and branches which their companies have built or acquired since the war. This is a good reason for avoiding the acquisition of such lines on the old terms—requiring a yearly net income on the entire cost, or even on an exaggerated capital account; but it is one thing to buy a railroad which will fail on your hands and quite another to buy one which has already failed, and which can be had probably for a fraction of its original cost or of the sum which would reproduce it even in these cheap times. Some one must own these roads. Who can work them to the best advantage—at the least expense for operation and with the least disturbance to traffic and the general railroad business of the country? There is but one answer to this question, and sooner or later, we believe, the solvent companies will absorb most of the new connecting lines which have become bankrupt of late years. In many cases they will never have a more favorable opportunity for doing this. The present proprietors have at last become pretty well satisfied that they cannot get satisfactory results from their property; by and by they may discover that they have a hitherto unsuspected power for evil and will charge something for that. In most cases a solvent railroad company with whose lines a bankrupt road competes can pay the present owners of the latter more than the road can possibly be worth to them and still make a profit on the investment. When both parties fully realize these facts we may expect to see a new period of railroad consolidations which will tend to reduce our present railroad chaos to something like a railroad system.

The Grain Movement for Twenty-three Weeks.

The shipments of grain of all kinds from the eight principal Northwestern markets for each week since April 22 have been, in bushels, by lake and by rail:

Week ending—	By lake.	By rail.	Total.	Per ct. by rail.
April 29	1,634,541	2,072,946	3,707,487	56
May 8	2,445,191	2,292,633	4,737,824	48½
" 13	1,538,526	2,302,940	3,841,466	60
" 20	1,602,170	2,016,304	3,618,474	55¾
" 27	1,747,408	1,820,456	3,567,864	51
June 3	2,412,162	1,797,922	4,210,084	42¾
" 10	2,894,915	2,147,670	5,042,585	42½
" 17	2,921,405	2,491,811	5,313,216	45
" 24	2,728,706	2,198,054	4,926,760	44½
July 1	1,821,155	1,784,548	3,605,703	49½
" 8	1,765,010	1,205,184	2,970,194	40¾
" 15	1,548,508	1,228,678	2,877,186	42¾
" 22	2,269,336	1,032,825	3,302,161	31¼
" 29	1,466,502	1,038,208	2,504,710	41½
Aug. 5	2,055,243	1,283,268	3,338,511	38½
" 12	1,744,059	1,300,720	3,044,779	42¾
" 19	2,150,292	1,614,256	3,764,548	42¾
" 26	2,352,152	1,520,811	3,872,963	39¼
Sept. 2	1,698,491	1,573,058	3,271,549	48¼
" 9	2,374,473	1,818,411	4,192,884	43½
" 16	2,963,634	1,688,318	4,651,952	36½
" 23	2,268,894	1,820,361	4,089,255	44½
" 30	2,427,357	1,797,847	4,225,204	42½
Total for 23 weeks	48,930,130	39,747,229	88,677,359	44¾

The September movement has been quite large—a quarter larger than last year—but it has been unusually light in wheat. The amount of rail shipments has been quite steady throughout the month, averaging 1,781,200 bushels weekly. The lake shipments have fluctuated more, which indicates that the railroads have taken about as much as they cared to, and that the vessels have taken the rest. It is noticeable also that the railroads have not increased their shipments, although there has been an increase in lake rates during the month.

During the same 23 weeks the receipts at the different Atlantic ports have been:

	Corn.	Per cent. of total.	All grains.	Per cent. of total.
New York	15,019,386	32.1	38,395,175	44.0
Boston	5,018,753	10.8	6,816,230	7.8
Portland	437,000	0.9	787,370	0.9
Montreal	2,800,937	6.0	9,521,982	10.9
Philadelphia	11,324,750	24.2	16,400,500	18.8
Baltimore	10,503,000	22.4	12,952,585	14.9
New Orleans	1,691,021	3.6	2,316,885	2.7
Total	46,794,847	100.0	87,190,727	100.0

New York during the past week has again advanced in rank as a corn receiver, while falling back a trifle as receiver of all grains. Montreal improves as much as New York as a corn receiver, while stationary in general grain receipts. Philadelphia falls back in corn receipts but maintains its position in the total; Baltimore just keeps its place in corn and advances in the total of grain.

During the last week, the percentage of the total receipts of corn at each port were: New York, 38 per cent.; Baltimore, 23; Philadelphia, 17⅓; Montreal, 14; Boston, 7⅓. In grain of all kinds these percentages were: New York, 43¼; Philadelphia, 17¾; Baltimore, 17⅝; Montreal, 11¾; Boston 9¼.

The corn receipts during the last week were 56¼ per cent. of the whole and wheat but 23 per cent. Corn receipts so great were never known before at this season of the year and wheat shipments so small not for many years.

Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

Delaware & Bound Brook.—The *Trenton Branch* is completed from Trenton Junction, N. J., southeast to Trenton, 4 miles.

Columbus & Toledo.—Extended from Fostoria, O., north to Bradner, 9 miles.

Dayton & Southeastern.—Track is laid from Washington Court House, O., west 3 miles. It is of 3-ft. gauge.

Worthington & Sioux Falls.—Extended from Adrian, Minn., west to Luverne, 15 miles.

International & Great Northern.—Extended from Round Rock, Tex., southwest to Duval, 11 miles.

This is a total of 42 miles of new railroad, making 1,719 miles completed in the United States in 1876, against 861 miles reported for the corresponding period in 1875; 1,125 in 1874, 2,867 in 1873 and 5,066 in 1872.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

Rhode Island & Massachusetts.—At a meeting held in Franklin, Mass., Oct. 4, this company was organized under the charter granted some time since by the election of the following directors: J. P. Ray, J. G. Ray, J. M. Freeman, H. M. Greene, A. H. Morse, F. B. Ray, E. L. Metcalf, E. K. Ray, A. A. Rusegue, E. Hartshorn, E. Waite, H. R. Jencks, G. W. Wiggin, Moses Farnum, T. G. Shain, J. P. Farmer, C. J. McKenzie, A. A. Fletcher. The board elected James P. Ray President; Erastus L. Metcalf, Vice-President; George W. Wiggin, Clerk; Joseph G. Ray, Treasurer.

Bangor & Calais Shore Line.—Mr. E. C. Pike, of Eastport Me., has been appointed General Manager.

Portland & Rochester.—At the annual meeting in Portland, Me., Oct. 4, the old board was re-elected, as follows: G. P. Westcott, John Lynch, Frederick Robie, H. J. Libby, J. S. Ricker, A. J. Shurtleff, Charles McCarthy, Jr., George E. B. Jackson, W. R. Wood, W. G. Ray, E. G. Wallace.

Hannibal & Naples.—At the annual meeting in Springfield, Ill., Oct. 4, the following directors were chosen: John W. Bunn, Jacob Bunn, C. M. Smith, H. S. Leland, Springfield, Ill.; C. L. Higbee, Pittsfield, Ill.; J. E. Moore, Griggsville, Ill.; A. R. Levering, Hannibal, Mo.; A. M. White, A. B. Baylis, New York. The board elected C. M. Smith President; W. B. Corneau, Secretary and Treasurer. The road is worked by the Toledo, Wabash & Western.

Hannibal Bridge.—At the annual meeting in Springfield, Ill. Oct. 4, the following directors were chosen: A. W. Lamb, C. M. Smith, A. M. White, A. Boody, A. B. Baylis.

Chicago & North Shore.—The first board of directors is as follows: R. B. Mason, C. J. Gilbert, T. B. Bryan, L. C. Pitner, J. W. Ulm, M. C. Springer, J. T. Dale, F. S. Howe, S. H. Kerfoot, D. J. Lake, J. W. Preston, Orrington Lunt. The officers are: T. B. Bryan, President; L. C. Pitner, Vice-President; C. T. Hotchkiss, Secretary; J. W. Ulm, M. C. Springer, L. C. Pitner, J. F. Dale, Executive Committee.

Pittsburgh, Wheeling & Kentucky —At the adjourned annual meeting in Wheeling, West Va., Sept. 28, the following directors were chosen: C. D. Hubbard, John McLure, M. Reilly, D. C. List, for Ohio County; Abram Wilson, H. J. Leasure, for Brooke County.

Louisville & Nashville.—At the annual meeting in Louisville Oct. 4, the following directors were chosen: E. D. Standiford, H. Victor Newcomb, B. F. Guthrie, W. B. Caldwell, W. H. Smith, H. C. Murrell, W. M. Farrington, P. J. Potter, George A. Washington, George H. Hutchings James W. Hayes. The board subsequently re-elected E. D. Standiford President; H. Victor Newcomb, Vice-President; W. Ramsey, Secretary; A. M. Quarrier, Assistant Secretary.

Central, of New Jersey.—At a meeting of the board in New York, Oct. 5, Mr. Franklin A. Comly, President of the North Pennsylvania Company, was chosen a director, in place of Adam Norrie, resigned. The board then accepted the resignation of Mr. John Taylor Johnston as President and elected Mr. E. C. Knight President in his place. Mr. Knight, who has been a director of the Central for a short time, is President of the Delaware & Bound Brook Company and a director of the North Pennsylvania. Mr. James Moore has been appointed Superintendent and Engineer, in place of R. E. Ricker, resigned. Mr. Moore has been connected with the Central from its first construction, was Chief Engineer for many years and for some ten years past has been Consulting Engineer. The change will take place Nov. 1.

Cumberland Valley.—At the annual meeting in Harrisburg, Pa., Oct. 2, Thomas B. Kennedy, of Chambersburg, Pa., was chosen President, with the following directors: John Stewart, Daniel O. Gehr, Chambersburg, Pa.; Frederick Watts, Carlisle, Pa.; Thomas A. Biddle, Thomas A. Scott, Wistar Morris, Josiah Bacon, Edmund Smith, George B. Roberts, Strickland Kneass, Philadelphia.

Eureka & Palisade.—At the annual meeting in Palisade, Nev., Sept. 16, the following directors were chosen: D. O. Mills, Wm. Sharon, Isaac L. Requa, John A. Shaw, P. Everts, Edgar Mills. The board re-elected Edgar Mills, President; P. Everts, General Superintendent.

Burlington & Lamoille.—At the annual meeting in Burlington, Vt., Oct. 3, the following directors were chosen: Nathaniel Parker, Lawrence Barnes, Morillo Noyes, C. W. Woodhouse, Elmore Johnson, Josiah Tuttle, H. M. Field, L. F. Terrill, N. H. Wetherbee, G. W. Hendee, D. C. Linsley, Waldo Brigham, W. B. Hatch. The board elected Wm. B. Hatch President; Nathaniel Parker, Vice-President; E. W. Peck, Secretary and Treasurer; Wm. Hale, Chief Engineer.

Buffalo, New York & Philadelphia.—At the annual meeting in Buffalo, Oct. 4, the following directors were chosen: James Brayley, Richard Bullymore, Cyrus Clarke, Thomas Clark, Wm. G. Fargo, George B. Gates, Wm. H. Glenny, C. J. Hamlin, George J. Magee, Sherman S. Jewett, James H. Metcalfe, Bronson C. Rumsey, J. F. Schoellkopf. The board elected Sherman S. Jewett President; George B. Gates, Vice-President.

Lafayette, Muncie & Blooming.on.—Mr. Eugene Allen is appointed Chief Train Dispatcher and Superintendent of Telegraph.

Keokuk & Northwestern.—The first board of directors of this new company has organized by electing R. H. Gillmore, President; Edmund Jaeger, Vice-President; Charles P. Birge, Secretary; Smith Hamill, Treasurer; Hon. George W. McCrary, Attorney; R. H. Gillmore, J. M. Shelley, A. L. Connable, Executive Committee. The company's office is in Keokuk, Ia.

North Wisconsin.—At the annual meeting in Milwaukee recently, the following directors were chosen: D. A. Baldwin,

Jacob Humbird, J. A. Humbird, I. Graves, A. H. Baldwin, J. B. G. Roberts, H. A. Taylor, J. C. Spooner and A. L. Clarke. The board subsequently elected the following officers: President, John A. Humbird, Vice-President, D. A. Baldwin; Secretary and Treasurer, A. J. Goss; Land Commissioner, William Dwelly.

Canada Central.—The new board has elected H. L. Redhead, President; Hon. J. Skead, Vice-President; Hon. A. B. Foster, Manager; A. B. Chaffee, Secretary-Treasurer.

Geneva, Ithaca & Sayre.—The first board of directors of this new company, organized by the parties who bought the Geneva, Ithaca & Athens road at foreclosure sale, is as follows: F. W. Prince, Geneva, N. Y.; Talmadge Delafield, Aurora, N. Y.; C. P. Gregg, Trumansburg, N. Y.; John A. Nichols, Spencer, N. Y.; John Rumsey, Ithaca, N. Y.; Howard Elmer, Waverly, N. Y.; Robert A. Packer, Sayre, Pa.; Asa Packer, Harry E. Packer, Mauch Chunk, Pa.; Robert H. Sayre, Bethlehem, Pa.; Charles Hartshorne, Wm. Elliott, Philadelphia; James Stillman, New York. The company is controlled by the Lehigh Valley.

Locomotive Firemen's International Union.—At the annual convention in Baltimore, Oct. 7, the following officers were chosen: Grand Master, Henry Hoffman, Schenectady, N. Y.; Vice Grand Master, J. C. Rowan, Madison, Mich.; Grand Secretary, J. Hurbar Cole, Chicago; Grand Treasurer, F. Fellows, Clinton, Ia.; Grand Marshal, J. Rambo, Philadelphia; Grand Guide, Samuel Cowan, St. Albans, Vt.; Grand Chaplain, J. A. Cockley, Baltimore.

Stratford & Huron.—At the annual meeting in Stratford, Ont., recently, the following directors were chosen: J. E. Bullock, T. S. Clark, James Fisher, S. S. Fuller, R. Rutherford, J. W. Scott, D. Tisdale. The board re-elected S. S. Fuller President; D. Tisdale, Vice-President.

Toledo, Wabash & Western.—At the annual meeting in Toledo, O., Oct. 4, the stockholders voted to abolish the classification of directors and to reduce the number to 13. The following directors were then chosen: Solon Humphreys, Ossian D. Ashley, Wm. M. Bliss, Thatcher M. Adams, Wm. J. Lyons, Cyrus W. Field, Edward P. Beach, Horace Porter, Darius P. Mangam, James A. Roosevelt, New York; Wm. P. Shearman, Brooklyn, N. Y.; Elisha A. Coray, Toledo, O.; John Crerar, Chicago. This is a sweeping change, the only directors in the list who were in the board last year being Messrs. Humphreys and Ashley. It will, however, make no change in the management of the road, which is still in the hands of the Receiver.

Southern Railway and Steamship Association.—At the annual meeting in Atlanta, Oct. 5, Hon. J. E. Brown, Western & Atlantic Company, was re-elected President, and C. A. Sindall Secretary.

The office of the General Commissioner has been removed from Atlanta to Macon, Ga.

Concord & Portsmouth.—At the annual meeting in Manchester, N. H., Oct. 5, the following directors were chosen: Samuel N. Bell, Benjamin F. Martin, Nathan Parker, Manchester, N. H.; John J. Pickering, Portsmouth, N. H.; Joseph B. Walker, Concord, N. H.; Stephen Kenrick, Franklin, N. H.; John J. Bell, Exeter, N. H. The board elected Stephen Kenrick President; Wm. H. Hackett, Clerk.

Maysville & Lexington.—Capt. George Collier has been appointed General Superintendent. He has been a passenger conductor on the road for several years.

PERSONAL.

—Mr. John Taylor Johnston has resigned his position as President of the Central Railroad Company of New Jersey. Mr. Johnston first became largely interested in the company more than 25 years ago, when its furtunes were at a very low tide, and was chosen President soon after. He has been at its head during all the great development of later years, and, whatever his errors of judgment may have been, he must be credited with an honest intention to forward its interests and build up its business. He was one of the largest holders of its stock, and consequently one of the heaviest losers by the recent fall in price.

—Mr. Adam Norrie, for many years a director of the Central Railroad Company of New Jersey, has resigned his position.

—Capt. R. H. Fitzhugh, late Chief Engineer of the Mount Sterling Coal Railroad in Kentucky, has gone to Texas, where he intends to take a position on the proposed Austin & Pacific Short Line.

—Mr. Neziah Bliss, one of the founders of the once-famous Novelty Iron Works in New York, died in Brooklyn, N. Y., Oct. 6, at the age of 87 years.

—Mr. M. P. Celleyham, formerly Chief Engineer of the Missouri, Iowa & Nebraska, and for some time past Assistant Roadmaster of the Chicago, Burlington & Quincy, died of brain fever at Queen City, Mo., Oct. 2. He was sick only a few days.

—Mr. G. A. Hobart, Receiver of the New Jersey Midland, has been nominated as a candidate for the State Senate by the Republicans of Passaic County, N. J. Mr. Hobart was a member of the lower House of the Legislature several terms, and Speaker for a year.

—Gen. N. J. T. Dana, an old army officer, has been appointed General Superintendent of the St. Louis, Rock Island & Chicago Railroad by the new management (Robert Harris, Managing Director), to succeed George Skinner, General Manager, resigned. General Dana was General Superintendent of the Quincy, Alton & St. Louis Railway previous to its purchase by the Chicago, Burlington & Quincy, and before that had been Superintendent of the Chicago, Pekin & Southwestern.

—Mr. R. E. Ricker has resigned his position as Superintendent and Engineer of the Central Railroad of New Jersey. Mr. Ricker came to the Central nine years ago, after the death of Mr. Josiah O. Stearns; he had been then for some time Superintendent of Motive Power of the Pennsylvania Railroad, and had, before going to the Pennsylvania, been General Superintendent of the Terre Haute & Indianapolis road.

TRAFFIC AND EARNINGS.

Railroad Traffic.

The shipments of through freight eastward over the Central Pacific in August were as follows:

	1876.	1875.	Increase.	P. c.
San Francisco, tons	6,733	3,413	3,320	97.6
Interior points	940	523	417	83.3
Total	7,673	3,936	3,737	95.8

The leading items of freight this year were 2,318 tons wool, 1,965 tons tea, 1,144 tons salmon and 637 tons ripe fruit.

Iron Ore Movement.

The shipments of iron ore from the Lake Superior Region from the opening of navigation up to the end of September were as follows:

	1876.	1875.	Increase.	P. c.
Marquette, tons	379,856	379,287	569	0.2
Escanaba	286,432	194,851	91,581	47.0
L'Anse	67,235	54,999	12,236	22.3
Total	733,523	629,037	104,386	16.6

Shipments of pig iron for the same period were from Marquette, 8,197 tons; from Grand Island, 8,874 tons.

Railroad Earnings.

Earnings for various periods are reported as follows:

	1876.	1875.	Inc. or Dec.	P. c.
Nine months ending Sept. 30:				
Atchison, Topeka & Santa Fe	$1,746,816	$1,004,233	Inc.. $742,583	73.9
Burlington, Cedar Rapids & Northern	831,234	936,570	Dec.. 105,336	11.2
Canada Southern	1,266,245	843,992	Inc.. 422,253	50.1
Central Pacific	13,143,166	12,567,044	Inc.. 576,122	4 6
Chicago & Alton	3,679,098	3,402,654	Inc.. 276,444	8.1
Chi., Milwaukee & St. Paul	5,861,570	$5,606,558	Inc.. $255,012	4.5
Cin., Lafayette & Chicago	281,658	292,111	Dec.. 10,453	3.6
Denver & Rio Gra'de, Main Line	293,675	265,000	Inc.. 28,675	10.8
Illinois Central	6,248,761	5,833,822	Dec.. 284,761	5.1
Indianapolis, Bloom. & Western	1,117,691	935,824	Inc.. 181,867	19.4
Michigan Central	5,061,409	4,810,755	Inc.. 250,654	5.2
Missouri, Kansas & Texas	2,260,650	2,003,509	Inc.. 257,141	12.8
Ohio & Mississippi	2,718,424	2,419,506	Inc.. 298,919	12.4
St. Louis, Alton & Terre Ha'te—Belleville Line	344,790	402,993	Dec.. 58,203	14.4
St. Louis, Iron Mountain & Southern	2,625,133	2,486,923	Inc.. 138,210	5.6
St. Louis, Kansas City & Northern	2,263,490	1,884,299	Inc.. 379,191	20.1
Toledo, Peoria & Warsaw	1,074,613	755,639	Inc.. 318,974	42.2
Eight months ending Aug. 31:				
Burlington & Mo. River in Nebraska	$456,486	$365,372	Inc.. $91,114	24.9
Expenses	208,395	179,856	Inc.. 28,539	15.9
Net earnings	$248,091	$185,516	Inc.. $62,575	33.7
Per cent. of exps..	45.65	49.22	Dec.. 3.57	7.3
Chicago, Burlington & Quincy	7,549,622	7,472,611	Inc.. 77,011	1.0
Expenses	4,073,695	3,918,381	Inc.. 155,314	4.0
Net earnings	$3,475,927	$3,554,230	Dec.. $78,303	2.2
Per cent. of exps..	53.96	52.44	Inc.. 1.52	2.9
Cleveland, Mt. Vernon & Delaware	245,283	275,167	Dec.. 29,884	10.9
Expenses	196,986	215,452	Dec.. 18,466	8.6
Net earnings	$48,297	$59,715	Dec.. $11,418	18.6
Per cent. of exps..	80.30	78.29	Inc.. 2.01	2.6
Flint & Pere Marquette	638,591	683,341	Dec.. 44,750	6.5
Houston & Texas Central	1,668,091	1,464,621	Inc.. 203,470	13.9
Expenses	1,213,572	1,208,736	Inc.. 4,836	0.4
Net earnings	$454,519	$255,885	Inc.. $198,634	77.6
Per cent. of exps..	72.75	82.53	Dec.. 9.78	11.9
Mobile & Ohio	1,069,018	998,309	Inc.. 70,709	7.1
Paducah & Memphis	134,798	121,111	Inc.. 13,687	11.3
Expenses	95,472	87,607	Inc.. 7,865	9.0
Net earnings	$39,326	$33,504	Inc.. $5,822	17.4
Per cent. of exps..	70.82	72.34	Dec.. 1.52	2.1
St. Louis, Iron Mt. & Southern	2,261,133	2,153,147	Inc.. 107,986	5.0
Expenses	1,264,114	1,274,909	Dec.. 10,795	0.8
Net earnings	$997,019	$878,238	Inc.. $118,781	13.5
Per cent. of exps..	55.91	59.21	Dec.. 3.30	5.6
Seven months ending July 31:				
International & Gt. Northern	$638,894	$662,061	Dec.. $23,167	3.5
Expenses	421,099	440,776	Dec.. 19,677	4.5
Net earnings	$217,795	$221,285	Dec.. $3,490	1.6
Per cent. of exps..	65.91	66.57	Dec.. 0.66	1.0
Five months ending Aug. 31:				
Nevada County	$36,032			
Expenses	16,679			
Net earnings	$19,353			
Per cent. of exps..	46.33			
Three months ending Aug. 31:				
Havana, Rantoul & Eastern	$14,104			
Expenses	9,345			
Net earnings	$4,759			
Per cent. of exps..	66.26			
Three months ending Sept. 30				
Toledo, Wabash & Western	$1,105,329	$952,274	Inc.. $153,055	16.1
Month of August:				
Flint & Pere Marquette	$84,486	$82,734	Inc.. 1,752	2.1
Leavenworth, Lawrence & Galveston	40,749	25,963	Inc.. 14,786	56.9
Mobile & Ohio	118,096	112,873	Inc.. 5,223	4.6
Nevada County	7,949			
Toledo, Wabash & Western	422,090	321,364	Inc.. 100,726	31.3
Month of September:				
Atchison, Topeka & Santa Fe	$254,024	$162,890	Inc.. $91,134	55.9
Burlington, Cedar Rapids & Northern	90,800	117,928	Dec.. 27,128	23.0
Canada Southern	158,618	117,109	Inc.. 41,509	35.4
Central Pacific	1,586,000	1,567,622	Inc.. 118,378	7.6
Chicago & Alton	517,992	490,283	Inc.. 27,649	5.6
Chi., Milwaukee & St. Paul	646,150	741,206	Dec.. 95,056	12.8
Cin., Lafayette & Chicago	34,040	41,726	Dec.. 7,686	18.4
Denver & Rio Gra'de, Main Line	32,470	29,266	Inc.. 3,204	10.9
Denver & Rio Gra'de, Trinidad Extension	13,559			
Hannibal & St. Joseph	183,000	154,634	Inc.. 28,366	18.3
Illinois Central	623,057	718,101	Dec.. 95,044	13.2
Indianapolis, Bloom. & Western	121,378	143,784	Dec.. 22,406	15.6
Michigan Central	622,526	620,814	Inc.. 1,712	0.3
Missouri, Kansas & Texas	324,144	291,827	Inc.. 32,317	11.1
Ohio & Mississippi	330,111	341,060	Dec.. 10,949	3.2
St. Louis, Alton & T. H., Belleville Line	44,589	48,710	Dec.. 4,121	8.5
St. Louis, Iron Mt. & So.	374,000	333,776	Inc.. 40,224	12.1
St. Louis, Kan. City & No.	290,601	246,624	Inc.. 43,977	17.8
Toledo, Peoria & Warsaw	145,028	123,894	Inc.. 21,134	17.1
Toledo, Wabash & Western	411,262	342,179	Inc.. 69,083	20.2

Cotton Rates from St. Louis.

The following rates have been adopted on cotton from St. Louis: To Baltimore, 70 cents per 100 pounds; to Philadelphia, 73 cents; to New York, 78 cents; to Boston, 83 cents. The new rates took effect Oct. 9, and are an advance of 18 cents per hundred. The railroad companies will in all cases compress cotton shipped on above rates, and no cotton will be forwarded as uncompressed to points named.

Lake and Canal Rates.

The Buffalo *Commercial Advertiser* says: "The average freight rates by lake for September show a small improvement over those of last year. The advance is slight, but even this is very welcome to vessel owners, as the course of freights for two seasons has been steadily downward. The following exhibit shows the comparative rates in September for a number of years:

	Lake.		Canal.	
Years.	Wheat. cents.	Corn. cents.	Wheat. cents.	Corn. cents.
1867	8.1	7.0	16.3	13.4
1868	9.1	7.7	16.2	13.6
1869	6.5	6.0	16.0	13.7
1870	5.6	4.1	10.8	10.0
1871	9.6	9.0	11.3	12.5
1872	14.8	13.8	12.5	11.6
1873	12.6	11.6	11.8	10.1
1874	3.5	3.2	9.5	8.5
1875	2.5	2.2	7.0	6.4
1876	2.6	2.3	6.2	5.6

"During the latter part of the month considerable firmness was developed at Chicago in consequence of the heavy receipts of grain. This improvement continues. Rates are more satisfactory from the West at present than they have been at any previous time this season. The complicated condition of affairs in Eastern Europe renders a rupture probable any day. In that event it is very desirable that grain dealers have their property within easy reach of the seaboard. They are consequently shipping freely and are likely to do so for the rest of the season. As yet the heavy movement of grain from the West has had very little influence on canal freights. The month opened with the rate on wheat at 6¼ cents and closed with it at 6¾ cents. But it is probable that an advance will take place this month."

Since the close of September, rates have advanced materially, especially by lake. The rate for corn from Chicago to Buffalo, which had advanced from 2½ to 3 cents per bushel by the 3d inst., was quoted at 4 cents on the 9th, with wheat from Milwaukee 5¼ cents on the 10th. Canal rates on the 10th were 7⅛ cents per bushel from Buffalo to New York for wheat, and 7 cents for corn. The lake and canal rate for corn from Chicago to New York is now about 12 cents, while the rail rate is but 11¼ centsat 20 cents per hundred.

Grain Movement.

Receipts and shipments for the nine months ending with September have been, in bushels:

	1876.	1875.	Inc. or Dec.	P. c.
Flour:				
Lake ports' receipts	3,822,303	3,390,398	Inc.. 431,905	12.7
Lake ports' shipments	3,146,319	3,725,224	Dec.. 578,905	15.5
Atlantic ports' receipts	6,917,132	6,725,804	Inc.. 191,328	2 8
Wheat:				
Lake ports' receipts	37,133,678	45,307,563	Dec.. 8,173,885	18.0
Lake ports' shipments	34,928,426	58,995,920	Dec..24,067,492	40 7
Atlantic ports' receipts	31,439,171	37,705,497	Dec.. 6,266,326	16.5
Corn:				
Lake ports' receipts	62,353,139	38,567,754	Inc..23,785,385	61.7
Lake ports' shipments	58,430,494	34,209,311	Inc..24,221,183	70.8
Atlantic ports' receipts	67,191,228	40,752,886	Inc..26,438,342	64.9
Grain of all kinds:				
Lake ports' receipts	124,644,912	107,078,154	Inc..17,566,758	16.4
Lake ports' shipments	112,608,642	108,317,011	Inc.. 4,291,631	4.0
Atlantic ports' receipts	120,704,119	99,050,212	Inc..21,653,907	21.8

This shows a very large decrease in the wheat traffic, more than counterbalanced by the very large increase in the corn traffic. In all grains the receipts at lake ports this year are larger by 16½ per cent., their shipments by 4 per cent., and the receipts on the Atlantic sea-board by nearly 22 per cent.

The lake ports' receipts of all grains are this year 8 per cent. less than in 1874 and 24 per cent. less than in 1873. The lake ports' shipments are 10 per cent. more than in 1874 and 11 per cent. more than in 1873.

The Atlantic receipts are 11 per cent. more than in 1874, and 33⅓ per cent. more than in 1873. Thus except in receipts at lake ports, the business of the nine months has never been equalled, for the crop of 1873–74 was the greatest in the history of the country up to that time.

For the week ending Sept. 30 receipts and shipments of all kinds of grain were:

	1876.	1875.	Increase.	P. c.
Lake ports' receipts	6,217,474	5,012,745	1,204,729	24.0
Lake ports' shipments	4,225,204	3,767,358	457,846	12.1
Atlantic ports' receipts	3,192,147	3,000,941	191,206	6.4

Of the lake ports' shipments, 42½ per cent. went by rail this year, against 32¾ per cent. in 1875 and 13⅛ in 1874.

Chicago receipts and shipments for the week ending Oct. 7, were:

	1876.	1875.	Increase.	P.c.
Receipts	3,575,535	1,949,728	1,625,807	83.4
Shipments	2,665,204	1,901,530	763,764	40.2

Coal Movement.

Reports of coal tonnage for the nine months ending Sept. 30, are as follows, by the figures indicated by the *Engineering and Mining Journal*:

Anthracite:	1876.	1875.	Inc. or Dec.	P. c.
Philadelphia & Reading	3,168,698	3,087,155	Inc.. 81,543	2.6
Northern Central, from Shamokin Div. and Summit Branch	617,902	912,515	Dec.. 294,613	32.5
Danville, Hazleton & Wilkesbarre	31,702	58,067	Dec.. 26,365	45.4
Central of N. J., Lehigh Div.	1,889,863	1,346,210	Inc.. 543,653	40.4
Lehigh Valley	2,533,166	1,989,033	Inc.. 544,133	27.4
Pennsylvania & New York	17,488	79,292	Dec.. 61,804	76.7
Pennsylvania Canal	288,882	199,875	Inc.. 89,007	44 5
Delaware, Lackawanna & Western	1,180,431	2,313,339	Dec..1,132,908	49.0
Delaware & Hudson Canal Co	1,362,389	2,341,155	Dec.. 978,766	41.8
State Line & Sullivan	27,663	5,557	Inc.. 22,106	398.0
Pennsylvania Coal Co	734,954	1,009,108	Dec.. 274,154	27.2
Total anthracite	11,853,140	13,341,306	Dec..1,488,166	11.2
Semi-bituminous:				
Cumberland, all lines	1,314,832	1,761,790	Dec.. 446,958	25.3
Huntington & Broad Top	116,338	160,849	Dec.. 44,511	27.7
East Broad Top	50,663	33,371	Inc.. 17,292	51.8
Tyrone & Clearfield	880,711	669,790	Inc.. 210,921	31.5
Bellefonte & Snow Shoe	38,404	47,486	Dec.. 9,082	19.1
Total semi-bituminous	2,400,948	2,673,286	Dec.. 272,298	10.2
Bituminous:				
Barclay	247,674	242,992	Inc.. 4,682	1.9
Allegheny Region, Pa. R.R.	152,426	163,166	Dec.. 10,740	6.6
Penn and Westmoreland gas coal	593,950	492,879	Inc.. 101,080	20.5
Pittsburgh Region, Pa.R.R.	206,471	478,528	Dec.. 82,785	17.1
Western Pennsylvania R.R.	146,801			
Southwest Pennsylv'a R.R.	42,471			
Total bituminous	1,389,802	1,377,565	Inc.. 12,237	0.9
Coke:				
Penn and Westmoreland	38,169	25,798	Inc.. 12,371	47.9
Pittsburgh Region, Pa. R. R.	119,107	79,542	Inc.. 39,565	49.8
Western Pennsylvania R.R.	34,459	38,195	Dec.. 3,736	9.8
Southwest Pennsylvania R. R.	373,185	407,785	Dec.. 34,600	8.5
Total coke	564,920	551,320	Inc.. 13,600	2.5

The tonnage in each case is that originating on the line given.

The Pennsylvania Railroad has made a reduction of 25 cents

per ton on Clearfield coal sent to Philadelphia for shipment. No reduction is made in freight to South Amboy.

There has been established in New York the General Coal Agency of the Chesapeake & Ohio Railroad Company, the object of which is to sell, and especially to make known and introduce to the market the various coals mined on the line of that road. Mr. A. S. Hatch, of the banking firm of Fisk & Hatch, is General Manager of the agency.

The Philadelphia & Reading Coal & Iron Company is about to ship a cargo of anthracite coal to Rio de Janeiro, Brazil, for the purpose of seeing what can be done to open a market for its coal in South America. The principal coal supply of Brazil, and indeed all the South American countries, has heretofore been drawn from England. Coal is mined to a small extent in Chile, we believe, and some deposits have been found in Peru, but they are not worked, owing to their inaccessible location. Little coal is used in South America, however, and of course all the apparatus for coal consumption is adapted to bituminous and not to anthracite. The Philadelphia & Reading Coal & Iron Company's October circular makes no change from September. The prices for coal delivered on board at Port Richmond are for hard white ash and free-burning white ash lump, steamboat, broken and egg, $3.20; stove, $3.70; No. 1 chestnut, $3.20; No. 2, $2.70; pea coal, $1.95. The Schuylkill red ash will be $3.30 for egg; $3.80 for stove, and $3.20 for No. 1 chestnut. North Franklin red ash and Lorberry coal $4.20 for broken, egg and stove and $3.25 for No. 1 chestnut—the Lykens Valley vein being 50 cents per ton higher than Lorberry. The prices for the line and city trade at Schuylkill Haven and Port Clinton also remain unchanged from last month.

Hog Products.

The exports for the 11 months from Nov. 1, 1875, to Sept. 30, 1876, were, in tons:

	1876.	1875.	Increase.	P. c.
Pork	22,603	20,528	2,075	10.1
Lard	86,077	76,903	9,174	11.6
Bacon	179,708	123,906	55,802	45.0

THE SCRAP HEAP.

Railroad Manufactures.

The Cleveland (O.) Rolling Mill Company's rail mill recently turned out in 24 hours' consecutive work 880 rails, 60 pounds to the yard.

The Verona (Pa.) Tool Works are shipping a quantity of their patent nut-locks to Cuba.

The Valley Furnace, at Sharpsville, Pa., has gone into blast.

The steam forge and the pipe mill of Seyfert, McManus & Co., at Reading, Pa., have been running about three-quarters time. The nail mill is on half time and the sheet mill is still idle.

The Indianapolis Rolling Mill Company has contracts to re-roll rails for the Terre Haute & Indianapolis and the Cincinnati, Lafayette & Chicago roads, also one for new iron rails for the Indianapolis, Peru & Chicago.

The Terre Haute & Indianapolis Company is receiving a large lot of steel rails from the Edgar Thomson Steel Works.

The Terre Haute (Ind.) Car Company has finished orders on hand and has recently secured another large order for box cars.

The Keystone Furnace, at Reading, Pa., is making 350 tons of pig iron per week, and has orders for a considerable quantity ahead.

Mr. Wendell Bollman, of Baltimore, has a contract for an iron truss bridge, 120 feet span, over Conewago Creek, near New Oxford, Pa., on the Hanover Junction, Hanover & Gettysburg road. It is to be erected without interrupting travel over the road.

The Vigo Iron Company's No. 1 furnace, at Terre Haute, Ind., has gone into blast, using block coal from Brazil, Ind., as fuel.

Charles W. Spurr, of Boston, has recently fitted up a passenger coach on the Fitchburg Railroad with his patent papered wood hangings. These hangings are formed of a very thin sheet of wood mounted on paper or cloth and then applied to the wall and finished just as fine furniture is finished. Sheets 180 to the inch take as fine a finish as a thick plank. These hangings have been used for some time in houses, but their application to passenger cars is new, we believe.

The Tilghman Sand-Blast Works, at Boston, were bought out Sept. 1, by Messrs. Goodwin, Burger & Palmer, and are now known as the Boston Sand-Blast Works. They are running full time with a full force and are now supplying glass cut and ornamented by the sand-blast process to the Boston & Albany and the Boston, Revere Beach & Lynn roads; the Harlan & Hollingsworth Manufacturing Company, at Wilmington, Del.; the Ranlet Car Company, at Laconia, N. H.; Wm. F. Blum, of Louisville, and many others. They furnished all the ornamental glass work for the large steamer Columbia, recently built by the Harlan & Hollingsworth Company.

The Manchester (N. H.) Locomotive Works are at work on an order for 10 engines for a Canadian road.

The carworks of H. T. & J. N. Keith, at West Sandwich, Mass., have an order for platform cars for a railroad in Cuba.

The Empire Car Works, at York, Pa., have an additional order for 400 freight cars for the Texas & Pacific road.

The Pottsville (Pa.) Rolling Mill is in full operation with a slightly reduced force employed.

The Canada Engine & Machine Company at Kingston, Ont., has a contract for a number of locomotives for the Quebec, Montreal, Ottawa & Occidental Railway.

The Danforth Locomotive Works, at Paterson, N. J., have just completed a steam street car, which is to be tried on a street railroad in that city.

The Rhode Island Locomotive Works, at Providence, have just completed two engines for the Connecticut Central road.

The Hinkley Locomotive Works, at Boston, last week delivered a new engine to the Connecticut Valley road.

OLD AND NEW ROADS.

Southern Railway & Steamship Association.

Notice is given that the office of the General Commissioner, Mr. Virgil Powers, has been removed from Atlanta, Ga., to Macon, Ga., where all communications should be addressed.

The annual meeting of the association began in Atlanta, Ga., Oct. 5. The General Commissioner presented his report, which was referred to a committee of five. Messrs. King, of the Georgia Railroad, and Magrath, of the South Carolina Railroad, were appointed a committee on balances due by the Charleston Steamship Line, to report to an adjourned meeting to be held in two weeks.

Meetings.

The following companies will hold their annual meetings at the times and places given:

Cincinnati, Sandusky & Cleveland, at the office in Sandusky, O., Oct. 18, at 10 a. m.

Vermont & Canada, in Bellows Falls, Vt., Oct. 19.

Indianapolis, Cincinnati & Lafayette, at the office in Indianapolis, Ind., Nov. 6, at noon.

Pennsylvania.

The New York *Commercial Advertiser* of Oct. 6 says: "The business of the Pennsylvania Railroad last month, as appears from records carefully taken, surpassed anything before experienced in the history of the road, not excepting the heavy traffic occasioned by the war. And for the length of road, 90 miles, it is certain that no parallel can be found in any other railroad in the United States, if in the world. Coming directly down to the figures, the number of Centennial passengers carried in September over the New York Division of 90 miles was..... 370,371
Number of through and local..... 639,069

Total..... 1,009,440

"This does not include commuters or school travel. As before intimated, the statistics of war times are tame in the comparison. The highest number of passengers moved during the war in one day, outside of regular business, all included, was 16,000. One day there were five regiments of troops transported, making an aggregate of 21,000.

"The highest number of Centennial passengers carried on a single day was 25,058, that occasion being 'New York Day,' Sept. 25. The lowest number carried on any single day in the month was 8,426, on Sept. 4, making the daily average of Centennial travel 12,345. Taking the aggregate figures, the highest number of through and local passengers transported on any single day was 28,744, viz., Sept. 1, and the daily average for month was 21,908. The amount of earnings is not given, but in a statement published a few days ago they were shown to average over $1 per head, exceeding $1,000,000 for the entire month, on passenger business alone. It should be noted that this heavy work was done without personal injury to a single passenger of the multitude thronging that great thoroughfare. This, it is claimed, beats everything."

Atlantic & Pacific.

The United States Circuit Court has finally confirmed the sale of this road under foreclosure. The decree was entered last week and the deed was to be made and the road transferred to the purchaser, Mr. Wm. Buckley, Oct. 11. He will at once transfer the property to the new St. Louis & San Francisco Company.

Delaware, Lackawana & Western.

Notice was given last week that after Oct. 7 a reduction of 10 per cent. would be made in the wages of all employes of the road. The men in the repair shops at Scranton, Pa., numbering nearly 1,000, at once quit work, refusing to submit to the reduction. They subsequently held a meeting and passed resolutions setting forth that they had already submitted to three reductions and that this new one would leave them unable to support themselves and their families. It is said also that the men in the Great Bend and Syracuse shops will join in the strike.

The trainmen have thus far taken no action, and it is thought that they will submit to the reduction.

Buffalo & Jamestown.

A statement made by the company shows the condition of the company as follows:

Stock paid in	$1,361,200
First-mortgage bonds sold	1,108,000
Floating debt, secured	154,564
Floating debt, unsecured	12,000
Coupons overdue	100,000
Total	$2,735,764

There are $215,000 stock subscriptions unpaid, $15,000 from individuals and $200,000 from the town of Ellicott, a suit concerning the latter being now open before the Court of Appeals. The cost of the road and equipment was $2,826,748.70, or over $40,000 per mile. Besides the bonds sold, some are issued and pledged as collateral for floating debt. Arrangements have lately been made from which a large increase of business is expected.

North Wisconsin.

At the annual meeting recently it was stated that no work had been done during the year, in consequence of pending suits by which the company was prevented from selling lands. As soon as these are settled it is intended to push the work.

Petersburg.

In the United States Circuit Court at Richmond, Va., last week, Atkins & Brother and the Safe Deposit Company, of Pottsville, Pa., filed a bill for the appointment of a receiver. The complaint sets forth that the petitioners hold judgments against the company which they cannot collect; that the company has not paid all the interest on its bonds, thereby endangering their claim; that its management has been detrimental to the property and destructive to the rights of creditors, and that the iron rails have been taken up from the Gaston Branch and sold, thereby diminishing their security. They ask that a receiver be appointed with power to apply the net earnings, after paying interest on the first and second-mortgage bonds, to the payment of petitioners and other creditors.

Argument on the petition was to be heard this week. The road runs from Petersburg, Va., southward to Weldon, N. C., 63 miles.

Geneva, Ithaca & Athens.

The Court has confirmed the sale of both the Geneva & Ithaca and the Ithaca & Athens sections of this road under foreclosure. The purchasers have organized a new company under the name of the Geneva, Ithaca & Sayre Railroad Company, the directors of which are nearly all connected with the Lehigh Valley Company, which controls the road, and in whose interest it was bought at the sale.

Texas Western.

The Houston (Tex.) *Telegraph* says that the contract for 100 miles of road, to Lagrange, has been let to H. D. McDaniels, General Superintendent of the road, and that he has gone to Kansas City to buy the necessary tools and equipment for the work. He intends to put a large force upon the grading as soon as he returns.

Columbus & Toledo.

The tracklayers on this road have reached Bradner, O., 100 miles north by west from Columbus, and 23 from Toledo. The ballasting and surfacing of the track is completed for 50 miles from Columbus, except about four miles. The telegraph line is being put up and is nearly completed from Columbus north to Delaware. Work is progressing well on the depot buildings.

Houston & East Texas.

This company has contracted for the iron and fastenings for 25 miles of road, also for equipment for the same. It is intended to push the work on that section. Negotiations are in progress with the Southwestern & Rio Grande Company for a connection between the two projected roads, so as to form a continuous line from Houston, Tex., to Shreveport, La.

Pacific, of Missouri.

The United States Circuit Court has finally decided to refuse the petition of certain stockholders to set aside the sale of the road. The Court also refused to allow an appeal and said that the only course which could now be taken by petitioners was to apply to the Supreme Court for a *mandamus* to the Circuit Court to allow an appeal.

The final decree confirming the sale was made last week. The deed was to be given and the road transferred to the purchasers Oct. 11. Nothing further has been made public as to the organization of the new company.

Lafayette, Muncie & Bloomington.

A telegraph line has been put up over the Eastern Division, from Lafayette, Ind., to Muncie. The company is making arrangements to build repair shops at Lafayette sufficient for the need of the road. Much of the equipment now in use is temporarily borrowed from the Toledo, Wabash & Western, until the company can secure additional rolling stock of its own.

Lee & Pudson.

The graded road-bed of this road was sold at Lee, Mass., Oct. 7, under a mortgage for $12,000 held by James W. Dwyer, the contractor. It was bought for $10,000 by Mr. Wellington Smith, of Lee, acting for some of the manufacturers of that town.

Coney Island & East River.

A company by this name has been organized to build a suburban line from Brooklyn, N. Y., to Coney Island. There are already two lines connecting the two places. The new company has asked permission to run its line, to be operated by steam, as far as Atlantic avenue in Brooklyn. It is proposed to pass under a part of Prospect Park by a tunnel, and to bridge most of the city streets.

Gulf, Western Texas & Pacific.

It is reported that Mr. Charles Morgan is making arrangements to buy in this road at the sale in December, and that he intends not only to resume operations on it, but also to extend it from Cuero through Gonzales to Austin. The San Antonio connection will then be made over the Galveston, Harrisburg & San Antonio road, with whose owners it is said that Mr. Morgan has come to an agreement.

Gainesville & Sherman.

This projected line is now trying to secure an indorsement from the Texas & Pacific. The plan proposed is for the people on the line to raise enough to grade and tie the road from Gainesville, Tex., east to a connection with the Texas & Pacific near Sherman, about 25 miles. The latter company is then to indorse the bonds to an amount sufficient to buy the iron, and to equip and operate the road when finished.

Wilmington & Reading.

This road was to have been sold under a decree granted by the United States Circuit Court for foreclosure of the first mortgage in Philadelphia, Oct. 2. Counsel for the second-mortgage bondholders, who had opposed the foreclosure, succeeded in securing from a justice of the Supreme Court at Washington a writ of *supersedeas*, on the ground of defective jurisdiction. The Circuit Court thereupon ordered the sale postponed until Nov. 1. A formal appeal from the decree has been taken in the Circuit Court and the necessary bonds filed to take the case up to the Supreme Court.

Philadelphia, Newtown & New York.

Under the decree of foreclosure of the first mortgage this road was sold in Philadelphia, Oct. 4. It was bought by Isaac Eyre, of Newtown, Pa., for $10,000, for account of a committee representing the bondholders. The sale included six miles of finished road, from Erie avenue, Philadelphia, to Fox Chase, and a road-bed graded to Newtown, 15 miles further.

Illinois Central.

The Land Department reports for September sales of 533.48 acres of land for $3,608.36. Cash collections on land contracts were $9,184.74.

The Traffic Department reports earnings for September as follows:

	1876.	1875.	Decrease.	P. c.
In Illinois, 707 miles	$499,051 28	$559,138 19	$60,086 91	10.7
In Iowa, 402 miles	124,005 57	158,963 01	34,957 44	22.0
Total, 1,109 miles	$623,056 85	$718,101 20	$95,044 35	13.2

The Illinois earnings were $706 per mile, the Iowa earnings $308, and the average for the whole road $562 per mile.

Chicago & Southwestern.

In accordance with the decree of foreclosure granted by the United States Circuit Court this road is to be sold at public sale Nov. 1.

International & Great Northern.

The track of the Western Division is now laid to Duval, Tex., 11 miles beyond the late terminus at Round Rock, 53 miles southwestward from Rockdale and 174 miles from Hearne. Trains are running through to Duval regularly. Contracts were to be let this week for the 10 miles from Duval to Austin, and also for the building of a bridge over the Colorado River at Austin.

St. Louis, Rock Island & Chicago.

The purchase by the Chicago, Burlington & Quincy Company was by acquiring the entire stock of the company, which remains a distinct organization. The purchasing company had virtual possession from the 1st of October, taking all the receipts and assuming all the expenses on that date, but formal possession was taken on the 6th, when the price was paid over.

East Tennessee, Virginia & Georgia.

A special Centennial excursion train of Pullman cars, which left Atlanta, Ga., on the morning of Oct. 9, made the run from Atlanta to Bristol, Tenn., over this road and the Western & Atlantic in 12 hours, including stops. The actual running time was 10¼ hours, the distance being 340 miles, making the average speed 33.17 miles per hour. Including stops the average time was 28.33 miles per hour. The excursion train was in charge of B. W. Wrenn, General Passenger Agent of the Kenesaw Route, and Thomas Magill, Agent of the Western & Atlantic road.

Railroad Mail Service Compensation.

The Special Commission on Railroad Mail Service, after concluding its sessions in Cincinnati, adjourned to Louisville, where its first meeting was held Oct. 2. The principal witness who appeared before the Commission was Mr. Albert Fink, who is probably more competent, from his knowledge and long study of the questions involved, to give advice than any other man who could be consulted. Mr. Fink's testimony is said to have been very interesting and valuable. President Standiford and General Superintendent Rowland, of the Louisville & Nashville Railroad, also made statements.

The Commission, after leaving Louisville, went to Nashville and then to Atlanta. At Nashville they met a number of railroad officers and merchants. At Atlanta the commission attended, by invitation, a meeting of the Southern Railway and Steamship Association, then in session, and Hon. Gardner G. Hubbard, Chairman of the commission, made a short address. Subsequently a number of the members of the Association appeared before the commission and expressed their views on the transportation of mails.

Grand Rapids & Indiana.

Proposals will be received at the office of the trustees, No. 23 Fifth avenue, New York, until Oct. 18, for the sale to them of $45,000 first mortgage gold bonds of this company for the sinking fund, as provided in the mortgage.

Erie.

The company has had an enormous passenger traffic throughout the season, stimulated by the extremely low rates which it has made for local and excursion traffic, and by its new connection with Philadelphia. Most of the season its rate from New York to Buffalo and Niagara Falls has been $5, with return tickets $9, which is just about one cent a mile. Its rates to other points where it competes with the New York Central, such as Rochester and Syracuse, have also been considerably less than the Central's rates. It has had, too, an enormous

excursion traffic in special trains to Philadelphia. This latter traffic has now fallen off a good deal, but the regular Centennial traffic remains very large. Under any ordinary circumstances the rates accepted would preclude any possibility of profit; in fact, this company's reports heretofore have shown passenger expenses very nearly or quite equal to passenger receipts; but this year, at least during the latter part of the season, the passenger traffic has been conducted chiefly in very large and full trains, whereas on the average on this road for two years previous the average train-load has been less than 50 and would not quite fill a single car.

The Receiver's report as filed for June shows receipts and payments as follows:

Balance on hand June 1	$485,922 98
Receipts for the month	1,724,385 31
Total	$2,210,308 29
Disbursements for the month	1,781,287 39
Balance, July 1	$429,020 40

The disbursements were greater than the receipts by $56,902.58. The receipts included $15,000 from Receiver's certificates issued and $23,000 from call loans. The certificates outstanding at the close of the month were $1,435,000. Disbursements included $9,800 for locomotives and $18,564 on account of purchases of coal lands.

The Peoria Pool.

The Indianapolis *Journal*, of Oct. 7, says: "Gen. George B. Wright, Receiver of the Indianapolis, Bloomington & Western road, states that the understanding was mutual with the management of that line, the Toledo, Peoria & Warsaw, and the Indianapolis, Cincinnati & Lafayette railroad companies, that on and after Oct. 1 the earnings on their passenger traffic out of Peoria should be pooled, but that on a trivial pretext the officers of one of the lines had declined to fulfill their part of the agreement; consequently the pool is off, and the indications are that no such arrangement can be made."

Worthington & Sioux Falls.

The track is now laid to Luverne, Minn., 34 miles west of the junction with the Sioux City & St. Paul road at Worthington, and trains are running regularly over the line. As heretofore noted, the road is built by parties connected with the St. Paul & Sioux City and the Sioux City & St. Paul companies, and will be worked in connection with those roads. It is intended to bring into market a section of the land grant belonging to those companies, and to be a feeder of the main line.

Dayton & Southeastern.

A correspondent writes as follows: "The rails have been laid on this narrow-gauge road from Xenia, O., to Jamestown 10.7 miles, and from Washington Court House westward 3.3 miles, total 14 miles to Oct. 1, 1876. The grading and bridging between Washington and Jamestown (18 miles) is completed with trifling exceptions, and tracklaying is in progress. Much of the grading on other parts of the line is well advanced."

Burlington, Cedar Rapids & Northern.

A circular from the board of directors announces that in view of the present condition and prospects of the road, and the fact that it is necessary to fix the rate of interest at a point which the road will certainly be able to pay regularly, it has been resolved to fix the rate of interest on the bonds of the new company at 5 per cent., instead of 6 per cent. as proposed by the plan of reorganization.

Havana, Rantoul & Eastern.

This company has been prosecuting a number of suits against subscribers to the stock who refused to pay up assessments on the ground that the organization was defective, the amount of stock required by law not having been subscribed. Several of these suits have been lately decided in favor of the company, and it is thought that the rest will be settled or compromised.

Locomotive Firemen's International Union.

The annual meeting of this association began in Baltimore, Oct. 6, a large number of delegates being present. At the public session the Grand Master's address was read, in which he stated the object of the organization to be the union of all locomotive firemen in the United States and Canada into one brotherhood for the protection of their interests as well as those of the railroads. He also advised all members to avail themselves of the benefits of the insurance offered by the order. The order has now 97 subordinate unions and over 4,000 members, and is in a very prosperous condition.

The subsequent proceedings were private, except the election of officers, whose names are noted elsewhere.

Alabama & Chattanooga.

According to the order of the United States Circuit Court this road was again sold in Mobile, Ala., Oct. 4, to meet the receivers' certificates and other debts, which the bondholders, who bought the road at the previous sale, failed to provide for as agreed. The property was bought for $310,000 by A. P. Balch, of New York, who represents the holders of the receivers' certificates.

Portland & Ogdensburg.

The employes of this road had resolved to strike Oct. 8, and had made all necessary arrangements, but consented to postpone the strike for three days, at the request of Superintendent Hamilton, in the hope that the company would make some provision to meet the case. The strike is for back pay, many of the men having five months' wages due them. They say they intend to stop all trains from running. At latest dates nothing had been done, and it is probable that the strike took place Oct. 11.

Little Rock, Mississippi River & Texas.

It is said that this company has finally decided to remove the Mississippi River terminus from Chicot, Ark., to Arkansas City, seven miles below, a point less subject to overflow and damage by the river.

St. Paul & Pacific.

A dispatch from St. Paul, Minn., dated Oct. 9, says: "Horace Thompson, Edmund Rice and John S. Kennedy, Trustees under the several mortgages against the First Division of the St. Paul & Pacific Railroad Company, took possession of the entire property this evening, and have given public notice to all whom it may concern that they will on and after this date operate the lines of the railroad as provided in said mortgage for the benefit of the bondholders."

This action is probably taken in consequence of the failure of the requisite number of bondholders to join in the Amsterdam agreement.

New York Central & Hudson River.

Wages of trackmen were reduced to a dollar a day Oct. 1. For most other employes the wages are no longer paid by the day, but by the hour, at the same rate as formerly, but the men are on four-fifths time.

There has been such a pressure of local traffic of late that 500 Merchants' Dispatch cars have been taken from the through traffic and pressed into the local service, which at current rates is far the most profitable.

The pressure of passenger traffic continues heavy, especially between Albany and Buffalo. It is considerably larger westward than eastward, most of the Centennial travel reaching Philadelphia by another route, but returning largely by way of New York and perhaps New England and this railroad. Still, many of the express trains out of New York require two engines. The size of the trains frequently increase to twenty or more cars at Albany, requiring four engines to haul it up the steep grade west of that place.

The Erie Railway, early in the season, reduced the local rates to points where it competes with the New York Central—Buffalo, Niagara Falls, Rochester and Syracuse—to very low prices. The New York Central did not follow the Erie in this reduction, and has maintained its rates two or three dollars higher than the Erie's throughout the season. Ordinarily it is supposed that such a difference is sufficient to divert nearly the whole traffic to the line with the lowest rates. This has not been so in this case, however: the Erie has very largely increased its business from these points, but the Central's passenger traffic from the same towns has continued large, and it is believed that the results have been more favorable than if the Erie rates had been met.

Toledo, Wabash & Western.

At the annual meeting in Toledo, Oct. 4, it was voted to abolish the classification of directors and to reduce the number from 15 to 13. The special committee to defend the rights of stockholders was continued, and the action taken at the special meeting of May 31 fully approved. It was also resolved to take legal measures to restore to the corporation bonds which have been illegally issued. The contribution of 25 cents per share for legal expenses was recognized as a liability of the corporation.

The board of directors chosen was almost entirely a new one, only two of the old directors remaining.

General Passenger Agent Malcolm has issued the following notice: "On and after Oct. 1 that portion of this line between LaFayette and Bloomington (leased)—known as the Bloomington Division—will be relinquished by this company and operated as an independent road, under name of the LaFayette, Muncie & Bloomington Railway. I have therefore to request that you, at your earliest convenience, replace all tickets to points on or *via* that road, with tickets having coupon for LaFayette, Muncie & Bloomington Railway, as per form described below. Until such time as tickets of the new issue are placed on sale, the one coupon will be protected through to destination—the entire proportion due on same being reported to this company."

Canadian Pacific.

The track is now laid for 32 miles west of Fort William, and 750 men are employed on the section of 72 miles next west.

Section 15 has recently been let to McDonald, Kane & Co., of Montreal, the lowest bidders, the amount being $1,443,175.

Galveston, Harrisburg & San Antonio.

It is said that arrangements have been completed to build a branch from the main line at Santa Clara crossing, west of Seguin, Tex., northward to New Braunfels, about 12 miles. New Braunfels is a German settlement and a flourishing town. Its vicinity is really thickly peopled and probably as prosperous as any part of the South.

Central, of New Jersey.

At a meeting of the directors in New York, Oct. 5, an important change was made, Mr. Edward C. Knight being chosen President in place of Mr. John Taylor Johnston, who resigns the office after holding it for more than 25 years. Mr. Knight, who was chosen a director a few weeks since, is President of the Delaware & Bound Brook and a director of the North Pennsylvania. At the same time the Philadelphia element in the board was further strengthened by the election of Mr. Franklin A. Comly, President of the North Pennsylvania, as a director, in place of Adam Norrie, resigned.

The change is said to foreshadow a transfer of the controlling interest in the company to a Philadelphia party which owns the North Pennsylvania, has lately built the Delaware & Bound Brook, and is also interested in the Lehigh Coal & Navigation Company. President Knight intends, it is said, to devote his time to consolidating and simplifying the business of the company, introducing greater economy in management and using every possible means to free it from its present embarrassments.

Reports have been in circulation that the Baltimore & Ohio had something to do with these changes and that it had secured a controlling interest in the New York & Philadelphia New Line, with a view of using it as an outlet for its business to New York. These reports are, however, denied by Mr. Johnston and by officers of the company.

Chicago & Alton.

Chicago papers report that this company has bought the branch track belonging to the Chicago & Wilmington Coal Company. It is also said that the intention is to extend it so as to make a branch from Braidwood west to Coal City in Grundy County, to reach the mines in that section.

The recent reduction of wages on this road caused much excitement among the numerous workmen employed in the Bloomington shops, and there was talk of a general strike there. A committee was appointed to go to Chicago and confer with the officers of the road. They returned and reported that they believed the temporary reduction was a necessity. The company offered also, in case any of the men wished to leave, to give them free transportation to any point on the road, for themselves and their families.

Boston & Albany.

The Boston *Journal* says: "The Boston & Albany Railroad Company have contracted with the Adams Express Company to do the express business upon the line of their road, which has been done for several years past by themselves under the title of the Boston & Albany Railroad Company's Express, the arrangement to take effect on Monday, Oct. 2." The Adams Express Company has heretofore done the express business on nearly all the New England lines south of the Boston & Albany. It does not, however, now do *all* the express business on the Boston & Albany, the American, as for many years previously, working over that line.

Mail Transportation.

The Post-Office Department has agreed with the New York Central & Hudson River Company to have the pouches containing the *registered* letters, together with a mail messenger, taken by the fast train to Chicago which leaves New York at 8 p. m., on which no other mail is carried.

Boston, Clinton, Fitchburg & New Bedford.

The 37 miles of this road from Fitchburg, Mass., to South Framingham, over which its heaviest traffic passes, are to be laid with steel rails in place of the present iron ones. The company purposes providing all its passenger-train cars with Washburn steel-tired wheels.

Cincinnati Southern.

At a recent meeting of the Joint Committee appointed by the Chamber of Commerce, the Board of Trade and the Board of Transportation of Cincinnati to consult with the trustees as to the working of this road when completed, a sub-committee presented an elaborate report. This report took strong grounds against a lease of the road, ended by presenting resolutions opposing the leasing of the road to any company or association; advocating its operation by the trustees, and recommending that steps be taken to secure for the trustees the necessary authority from the Legislature. Resolutions were also presented advocating the selection of a depot site as near the commercial center of the city as possible, and the establishment there of a Union depot for all roads entering the city.

The board of trustees will receive at their office in Cincinnati until Oct. 16, bids for $1,000,000 Cincinnati city bonds issued for the construction of this road, being part of the additional $6,000,000 authorized by the last legislature of Ohio, of which $3,000,000 have already been sold. The bonds will have 30 years to run, and bids will be received either for 7 per cent. currency bonds of $1,000 each, principal and interest payable in New York, or for 6 per cent. gold bonds, $1,000 or £200 each, payable at option of holders in New York or London. Proposals will also be received at the same time and place for an option for the whole or part of the $2,000,000 remaining to be issued, in either 7 per cent. currency or 6 per cent. gold bonds, as above.

Atlanta & Richmond Air Line.

Under the terms of the first mortgage executed July 1, 1870, and in compliance with a decree of the United States Circuit Court for the Northern District of Georgia, which decree has been confirmed by the United States Courts for the District of South Carolina and the Western District of North Carolina, John H. Fisher, R. A. Lancaster and Alfred Austell, trustees, will sell this road at public sale at the Court House in Atlanta, Ga., Dec. 5. The road from Atlanta, Ga., to Charlotte, N. C., 265 miles, will be sold in one parcel, together with all the franchises, lands, buildings, equipment and other property of the company. The purchaser must pay 10 per cent. of his bid in cash on the day of sale, and the balance in cash at the trustees' office in Atlanta by Dec. 26; provided that if the property is bought by or for the bondholders, bonds and unpaid coupons may be received in payment at their *pro rata* value. In case the purchaser fails to comply with the terms of sale, the trustees may offer the road again, upon due notice given, at public sale upon the same terms.

Burlington & Lamoille.

At the annual meeting in Burlington, Vt., last week, President Hatch reported that the grading was completed from Burlington to Cambridge, and that 1,200 tons of rails had been bought. The contractor's estimates amounted to $541,775.38, on which he had been paid $387,215.47 in cash and $222,000 in bonds, at 60 cents on the dollar. There had also been issued under the contract stock to the amount of $189,750. The amount of stock paid up and issued was $532,350. Under the contract the contractor was not obliged to complete the road to Cambridge until the Portland & Ogdensburg track had reached that point, but he had agreed to go on and lay the rails early next Spring, without regard to the Portland road.

Sussex.

This road is now doing a considerable business in iron ore from the mines near Franklin Furnace, N. J., which is carried to Waterloo and thence over the Delaware, Lackawanna & Western to the Scranton furnaces. The ore is carried in coal cars, which thus secure what they very seldom have, a return load.

Illinois Railroad Law.

The Peoria (Ill.) *Transcript* says: "The State Railroad and Warehouse Commissioners have just been notified that in the Warren County Circuit Court, a judgment has been rendered in the case of The People *vs.* The Chicago, Burlington & Quincy Railroad Company, instituted by the commissioners for extortionate charges in the transportation of freight, and a fine of $2,000 imposed upon the company. An appeal has been taken to the Supreme Court, and the commissioners claim that this is a case clear of all chances of being thrown out on technicalities, as some other of their cases have been, and that the main issue of the constitutionality of the law is squarely presented, and is the only question for the court to decide."

Toledo, Peoria & Warsaw.

In connection with the Illinois Central and the St. Louis, Keokuk & Northwestern this company now runs through cars between Chicago and Hannibal, Mo. The distances by this line are: Illinois Central, Chicago to Gilman, 81 miles; Toledo, Peoria & Warsaw, Gilman to Keokuk, 198 miles; St. Louis, Keokuk & Northwestern, Keokuk to Hannibal, 60 miles; total, 339 miles. The distance from Chicago to Hannibal by the Chicago, Burlington & Quincy is 281 miles.

Delaware & Bound Brook.

The work of laying track on the Trenton Branch is completed, and the line was to be opened for travel this week. It is four miles long, leaving the Main Line at Trenton Junction, five miles southwest of Pennington, N. J., and near the Delaware River, and running thence southeast to Trenton. Trains to and from Trenton will be run so as to make connections for both Philadelphia and New York.

North Georgia & North Carolina.

The President of this company has secured from the State the services of a number of convicts to work on the grading of the road in North Carolina.

North Pacific Coast.

Trains have begun to run through to the new terminus at Freestone, Cal., 10 miles beyond Tomales and 59 from Saucelito.

The bridge-builders are now at work on a trestle at Brown's Canon, two miles beyond Freestone, which will be 600 feet long and 135 feet high. It is the highest trestle bridge in California.

Southern Pacific.

Large quantities of ties are being sent forward for the extension of the track from Indian Wells, Cal., to Fort Yuma. The work of tracklaying is now in progress.

It is said that work has been begun on a branch running from the Tulare Division at Goshen west to Los Gatos, about 50 miles. The line runs north of Tulare Lake.

European & North American.

A circular dated at Bangor, Me., Oct. 2, and signed by Hannibal Hamlin and Wm. B. Hayford, trustees, calls attention to the fact that the trustees have taken possession of this road, "and that all arrangements hereafter to be made in regard to the operations of the railroad of said company, and dealings in relation to the same, must be made with us as trustees as aforesaid."

Remittances are to be made to Noah Woods, of Bangor, Me., who has been appointed Cashier.

Mr. Woods adds the following notice: "All correspondence relating to the Ticket Department should be addressed to Mr. J. F. Leavitt, who retains his place as General Ticket Agent."

Mr. Woods, who is Treasurer of the company, has been in charge some time as agent for the Trustee under the consolidated mortgage. As he still remains in charge, there will probably be no change in the management.

Grand Trunk.

The Port Huron (Mich.) *Times* thus describes the plans for the new shops which are to be established at that place: "The building, which is L-shaped, will have a total frontage on the street of 120 feet, and extending south in the company's grounds 244 feet, to which, as lean-tos, are attached four different buildings.

"The main building is subdivided as follows: To the repairing and rebuilding of locomotives is given a space of 74 × 104 feet, in which are five engine pits to be used in repairs; a traveling table of nearly 100 feet in space, to place engines off and on pits, fitters' benches, etc. The machine shops for lathes, etc., occupy a shop 15 × 35 feet; coppersmiths' shop, 15 × 25 feet; tool shop, 15 × 10 feet; boiler and blacksmiths' shop, 50 × 35 feet; T. Sutherland's car shop, for machinery, 35 × 50 feet; the lean-tos on the west side are a stationary en-

gine room, 26 × 19 feet, and a coal shed, 31 × 19 feet; on the east end a time-keeper's office will be erected, 16 × 18 feet, and on the south side of the north wing the foreman will have an office 18 × 19 feet in size.

"As a precaution against fire the different shops will have brick partitions between, extending to the roof. The building will be as nearly fire proof as possible, there being no wood used in the side walls, which are of brick two feet in thickness, resting on a solid stone foundation, thirty inches above the ground. There will be a truss roof covered with slate, the windows being similar to those in the present round house, and eight by ten feet in size. No expense will be spared by the company to have the shops equal, if not excel, any that have been erected in the State. The contractor is bound to have the walls ready for the roof within five weeks after commencing work, and fully completed and ready for occupancy the first day of January, 1877."

Cincinnati & Portsmouth.

The board has instructed Superintendent Wellman and Consulting Engineer Mohr to proceed at once to make the final location and secure the right of way from Bethel, O., to Portsmouth, in order that the contracts may be let. The work of locating was begun last week.

Chicago & North Shore.

This company, as already noted, proposes to build a suburban line from Chicago northward along the shore of Lake Michigan to Waukegan, about 36 miles. It is proposed to enter Chicago by building the road on piles from the north line of Lincoln Park to North Avenue and the building a tunnel under the city streets and the river to the corner of State and Randolph streets. The latter would be very costly, and hardly justified by the prospects of a road with nothing but a suburban traffic, all of which it will have to divert from a parallel and well established road.

Mount Sterling.

It is proposed to extend the Mount Sterling Coal Railroad from its present terminus at Bull Fork, Ky., to Frenchburg, 3½ miles. The estimated cost is about $30,000, and an effort is being made to secure subscriptions to that amount.

Manchester & Keene.

Orders have been given to the sub-contractors to stop all grading and all work except on the masonry. It is said that but little more will be done until next spring.

Pittsburgh, Wheeling & Kentucky.

At a meeting held in Wheeling, W. Va., Sept. 28, the stockholders voted to authorize an issue of bonds to the amount of $200,000, to be secured by mortgage upon the road. The proceeds of the bonds are to be used to iron and equip the road.

Portland & Rochester.

At the annual meeting in Portland, Me., Oct. 4, the stockholders voted to refer the whole matter of raising money to relieve the company from its embarrassments to the directors, with power to act.

Fall River.

It is said that this road is to be sold or leased to the Boston, Clinton, Fitchburg & New Bedford Company, whose system of lines it connects with the large manufacturing town of Fall River. The road, which is said to be doing a very good business, was completed last year, and extends from New Bedford, Mass., northeastward 12 miles to Fall River.

Rhode Island & Massachusetts.

At a meeting held in Franklin, Mass., Oct. 4, this company was organized under the charter secured several years ago. A large part of the stock has been subscribed. At the same meeting the stockholders voted to approve a contract made with E. G. Sweatt for the construction of the road, and the directors were instructed to sign and execute it at once. The contractor, who had everything in readiness, made a formal commencement of work the next day and will soon have a large force employed. The road is to extend from Franklin, Mass., on the New York & New England road, southward through Wrentham, Cumberland and West Attleboro to Central Falls, R. I., where it will connect with the Providence & Worcester road. It will be about 13 miles long and will serve the country lying between the Boston & Providence and the New York & New England's Woonsocket Division.

ANNUAL REPORTS.

Louisville & Nashville.

We give below the figures and a condensation of the President's report covering the year ending June 30, 1876, as presented to the stockholders at the recent annual meeting. The road worked was the same as for the previous year, and was as follows:

	Miles.
Main Stem, Louisville, Ky., south by west to Nashville Tenn..	185.00
Bardstown Branch, Junction to Bardstown, Ky	17.30
Knoxville Branch, Lebanon Junction, Ky., to Livingston	110.32
Richmond Branch, Junction to Richmond, Ky	33.46
Total Main Stem and branches	346.08
Memphis Line, Bowling Green, Ky., southwest to Memphis, Tenn	258.80
Glasgow Branch, leased, Junction to Glasgow, Ky	10.50
Nashville & Decatur R. R., leased, Nashville, Tenn, south to Decatur, Ala	122.30
South & North Alabama R. R., controlled, Decatur, Ala., south to Montgomery	183.00
Total worked	920.68

making a total of 604.88 miles owned, 132.80 leased, and 183 controlled. The whole system forms a line from Louisville southward to Montgomery, 490.3 miles long, with a principal branch to Memphis and the other minor branches.

The changes in the bonded debt during the year and its amount at the close were as follows:

Bonded debt as per last report		$17,206,810
Consolidated mortgage bonds issued		113,000
Mortgage on main office, lot and building		80,000
Total		$17,399,810
Main Stem bonds redeemed	$113,000	
Memphis Branch bonds redeemed	1,000	
Memphis & Ohio income bonds redeemed	158,000	
Second-mortgage gold bonds canceled	500,000	
Memphis, Clarksville & Louisville sinking fund	29,100	
Consolidated mortgage sinking fund	43,000	
		844,100
Outstanding bonded debt at close of year		$16,555,710

Showing a total reduction (besides the second-mortgage bonds canceled) of $151,100 during the year. There are included in the bonded debt $849,000 Louisville city bonds not secured by mortgage on the road. The bonded debt of the leased lines has also been reduced by the purchase of $42,000 Nashville & Decatur first-mortgage bonds and $62,000 South & North Alabama sterling bonds for the respective sinking funds.

The actual result of the year was as follows:

Net earnings Louisville & Nashville R. R. Co		$1,457,518 16
Interest on bonded and floating debt		1,117,297 76
Net balance		$340,520 40

This is an increase of $187,419.70 over the surplus of the previous fiscal year. A comparative statement of the earnings and expenses of all lines worked, including the South & North Alabama road, for four years past is as follows:

	1875-76.	1874-75.	1873-74.	1872-73.
Gross earnings	$4,961,490 29	$4,863,873 80	$5,510,695 45	$6,106,051 84
Expenses	2,993,530 24	3,181,740 96	3,945,313 11	4,622,004 47
Net earnings	$1,967,960 05	$1,682,132 84	$1,565,382 34	$1,484,047 37
Per cent. of expenses	60.34	65.42	71.59	75.69

In 1872-73 the South & North Alabama was worked only nine months; otherwise there has been no change in the road worked. The increase in net earnings has been secured in the face of a steady decline in rates received and an increase of traffic. A detailed statement for the last two years is as follows:

Gross earnings:	1875-76.	1874-75.	Inc. or Dec.	P. c.
Main Stem and branches (346.08 miles)	$2,498,505 42	$2,575,084 84	Dec.. $76,579 42	3.0
Memphis Line (258.80 miles)	1,139,424 33	1,119,359 82	Inc.. 20,064 51	1.8
Glasgow Branch (10.50 miles, leased)	16,456 83	19,850 38	Dec.. 3,393 55	17.1
Nashville & Decatur (122.30 miles, leased)	631,780 68	594,657 65	Inc.. 37,123.03	6.2
S. & N. Alabama (183 miles, controlled)	675,323 03	554,921 11	Inc.. 120,401 92	21.7
Total (920.68 miles)	$4,961,490 29	$4,863,873 80	Inc.. $97,616 49	2.0
Expenses:				
Main Stem and branches	1,386,710 99	1,573,368 32	Dec.. 186,657 43	11.9
Memphis Line	793,400 70	819,139 39	Dec.. 25,738 69	3.1
Glasgow Branch	12,250 94	11,604 28	Inc.. 646 66	5.6
Nashville & Decatur	382,074 82	388,442 58	Dec.. 6,367 76	1.6
South & North Alabama	419,092 89	389,186 39	Inc.. 29,906 50	7.7
Total	$2,993,530 24	$3,181,740 96	Dec.. $188,210 72	5.7
Net earnings:				
Main Stem and branches	1,111,794 53	1,001,716 52	Inc.. 110,078 01	11.0
Memphis Line	346,023 63	300,220 43	Inc.. 45,803 20	15.3
Glasgow Branch	4,205 89	8,246 10	Dec.. 4,040 21	49.2
Nashville & Decatur	249,705 86	206,215 07	Inc.. 43,490 79	21.1
South & North Alabama	256,230 14	165,734 72	Inc.. 90,495 42	54.6
Total	$1,967,960 05	$1,682,132 84	Inc.. $285,827 21	17.0

There was thus a gain in net earnings on every line except the short Glasgow Branch, the loss there arising from local and temporary causes. The general averages for the last year were as follows:

	Gross earnings per mile.	Expenses per mile.	Net earnings per mile.	Per cent. of expen.
Main stem and branches	$7,219	$4,007	$3,212	55.50
Memphis Line	4,403	3,066	1,337	69.63
Glasgow Branch	1,567	1,167	400	74.44
Nashville & Decatur	5,166	3,124	2,042	60.48
South & North Alabama	3,690	2,290	1,400	62.06
Whole line	$5,388	$3,251	$2,137	60.34

The net result of the Nashville & Decatur lease was as follows:

Net earnings of road		$249,705 86
Interest on bonded debt	$152,832 21	
Hire of engines and cars	33,045 35	
Dividends on stock, 14 months	111,050 73	
		296,928 29
Deficit		$47,222 43

Dividends were paid for 14 months in consequence of a change of the dividend periods from April and October to June and December. During the year, $8,469.49 were expended in improvements of road, making a total charge on improvement account of $258,123.00, which is to be reimbursed at the end of the lease.

The account with the South & North Alabama, controlled and worked, is as follows:

Net earnings of road		$256,230 14
Interest on bonded debt	$398,649 97	
Hire of engines and cars	60,014 20	
		458,664 17
Deficit		$202,434 03
Advanced on construction account		14,150 14
Sixty-two sterling bonds purchased		63,153 04
Advanced and interest on old account		146,720 86
Total charges during the year		$425,458 07

The Main Stem and indeed all the lines are in good condition, with abundant equipment. As the country along the line increases in population and production a system of short branch feeders will be of great value as bringing traffic to the Main Stem and also in preventing competition from parallel lines. The Bardstown and Glasgow branches are lines of this kind.

The Knoxville Branch now brings considerable revenue to the company, but its value would be much increased by an extension of 18 miles to London, which is a distributing point for a large extent of country. This extension from Livingston to London is graded and local aid can be secured to complete it. The Richmond Branch is of little value at present; but a local company purposes extending it to the Three Forks of Kentucky, tapping a coal and lumber country.

The Memphis Line is doing well, but suffers from the refusal of the line beyond Little Rock to make any arrangement for through Texas business, even to Louisville proper. An arbitrary or local rate is charged on all Texas business going or coming by way of Memphis, and all negotiations for a better arrangement have failed. The interests involved are large and this obstructive course may result in the building of a new line to Texarkana through Southwestern Arkansas, a project already under discussion by parties interested in the Memphis & Little Rock and Memphis & Charleston roads.

The South and North Alabama shows an encouraging gain. The iron and coal interests on this line are growing and the country is gradually filling up. As a through line, however, it has not had quite the success expected, chiefly because the connections south of Montgomery are not satisfactory. It is thought that the former management made a mistake in stopping at Montgomery; it should have secured control of a line through to a Gulf port, and this control is still necessary to a full development of this road. Three routes have been presented to the company for consideration and one of them will certainly have to be decided on in the near future.

The report, which is very long and interesting, refers further to the losses arising from the floods of August, 1875, and the high water of last fall, which made all the rivers navigable for a much longer period than usual, thus increasing competition and lowering rates, besides inflicting much damage on the road. The utmost efforts of the management have been directed to securing economy in working without allowing the condition of road or equipment to depreciate. Reference is also made to the gradual abandonment of the growing of cotton in the country directly on the line of the road, and the substitution therefor of grain, tobacco, cattle, sheep and hogs; this change is much to the advantage of the local traffic.

The new office building in Louisville is now nearly completed and ready for use. The President's report closes thus: "In conclusion, we have to say that the financial condition of our company within the past year has very much improved. We have come safely through one of the greatest financial depressions ever known in this country; and that in itself is a subject of felicitation for the stockholders. Our business is now constantly increasing, while our expenses are less to the mile than ever before. Every part of the road is in excellent condition: we have fewer accidents than ever, and what we do have are of a trifling nature; our organization is pronounced by experts as good as any in the country; the officers of the road are men of great skill; and we feel warranted in saying that, with a continuance of the present volume of business, we shall be able during the next year to resume the payment of dividends."

Atlantic & Great Western.

The Receiver's report to the Ohio Railroad Commissioner, being for the year ending with June, gives the following information:

The mileage worked during the year was 508, of which 422.8 miles is owned by the company and the remainder is leased. During the first six weeks of the year the company worked also the Niles & New Lisbon and Liberty & Vienna roads, 41 miles, which adds 5 to the average mileage worked during the year, though perhaps the results of the operations of these lines are not included in the report. The figures below are compared with those to the Ohio Commissioner for the preceding year, when the mileage was about 608.

The work of the year was:

Train mileage—	1875-76.	1874-75.	Inc. or Dec.	P. c.
Passenger	1,114,253	1,135,479	Dec.. 21,226	1.9
Freight	3,103,456	3,870,239	Dec.. 766,783	19.8
Service	103,047	73,078	Inc.. 29,969	41.0
Total	4,320,756	5,078,796	Dec.. 758,040	15.0
Passengers carried—				
Local	848,415	900,721	Dec.. 52,306	5.8
Through	80,436	75,024	Inc.. 5,412	7.2
Total	928,851	975,745	Dec.. 46,894	4.8
Passenger mileage	34,536,106	36,183,327	Dec.. 1,647,221	4.6
Tons carried—				
Local	2,060,588	1,687,938	Inc.. 372,650	22.1
Through	585,519	522,002	Inc.. 63,517	12.2
Total	2,646,107	2,209,940	Inc.. 436,167	19.8
Tonnage mileage	301,682,851	240,932,613	Inc.. 60,750,238	25.2
Average train-load—				
Passenger, No.	31	32		
Freight, tons	97⅛	62¾		

The receipts and expenses were:

Receipts:	1875-76.	1874-75.	Inc. or Dec.
Passengers—			
Local	$527,868	$599,519	Dec.. $71,656
Through	258,222	269,174	Dec.. 10,952
Total	$786,085	$868,693	Dec.. $82,608
Freight—			
Local	1,844,428	1,930,321	Dec.. 85,893
Through	1,028,800	1,098,459	Dec.. 69,659
Total	$2,873,228	$3,028,780	Dec.. $155,552
Mails	42,275	44,825	Dec.. 2,550
Expenses	55,676	72,261	Dec.. 16,585
Other sources	61,624	52,521	Inc.. 9,103
Total earnings	$3,818,888	$4,067,080	Dec.. $248,192
Working expenses:			
Maintenance of way and structures	$791,364	$854,306	Dec.. $62,942
Maintenance of cars	343,721	294,116	Inc.. 49,605
Motive power	336,343	377,747	Dec.. 41,404
Conducting transportation	1,421,785	1,651,285	Dec.. 229,500
Taxes, gen'l expenses, etc.	190,753	365,039	Dec.. 174,286
Total expenses	$3,083,966	$3,549,493	Dec.. $458,527
Net earnings	734,921	523,587	Inc.. 211,235
Per cent of expenses	80.75	87.11	
Per mile:			
Passenger-train miles	2,190	1,869	
Freight-train miles	6,109	6,333	
Passenger mileage	67,984	59,512	
Tonnage mileage	593,824	396,271	
Gross earnings	$7,517	$6,689	
Working expenses	6,070	5,826	
Net earnings	1,446	863	

There was paid for rents of leased lines during the last year $280,922, viz., $274,272 for the Cleveland & Mahoning, $3,000 for the Sharon Branch, and $3,650 for the Sharon Railway. This left a balance of $454,000 above expenses and rents. On the other hand there were the following additional expenditures:

Company's liabilities	$298,329
Interest on floating debt	12,165
Hire of cars and engines	240,022
Rents of docks and lots	7,707
Company expenses	39,014
Additions (construction)	155,673
Meadville hotel and dining room	13,604
Total	$760,517

The total expenditures thus exceeded the receipts from operation by $306,517, balanced by a sale of assets amounting to $70,404 and an addition of $236,112 to the floating debt.

The following is the Receiver's balance sheet, July 1, 1876:

Liabilities.

Assets of A. & G. W. R.R. Co. which came into hands of Receiver	$674,234	
Due to companies and individuals	1,336,943	
Profit and loss	87,696	
		$2,098,873

Assets.

Liabilities of A. & G. W. R. R. Co. paid by the Receiver	$1,108,868	
Additions (construction)	195,431	
Meadville hotel and dining room	23,151	
Supplies on hand	306,563	
Cash on hand	97,708	
Due by agents	49,827	
Due by Express Co.	5,879	
Due by U. S. Post Office Department	11,550	
Due by sundry companies and individuals	299,894	
		$2,098,873

The receipts per ton and per passenger per mile have been:

	1876.	1875.
Passenger mile	2.276 cts.	2.401 cts.
Ton mile	0.952 "	1.257 "

Showing a decrease of 5 per cent. in passenger and of 32 per cent. in freight rates.

The Philadelphia Awards.

We continue a list of those awards made by the judges at the International Exhibition, selecting those most likely to be interesting to our readers. Last week we published the complete list of awards in the group of "Railway Appliances, Plant, Rolling Stock, Engines, etc.," both American and foreign, and a selection from the American awards in the group of Metallurgy. Below we complete, so far as we have the

data, a list of the American awards most interesting to railroad men, beginning with those in

GROUP XX., "MOTORS, HYDRAULIC AND PNEUMATIC APPARATUS."

The judges for this group were: *American*—C. T. Porter, Newark, N. J.; Joseph Belknap, New York; James Moore, Philadelphia; Horatio Allen, President, South Orange, N. J.; Chas. E. Emery, New York. *Foreign*—W. H. Barlow, C. E., Great Britain; Prof. Francis Reuleaux, Germany; Nicholas Petroff, Russia; Emil Brugsch, Secretary, Egypt.

The following are the awards, selected from more than 400 given in the group:

Nathan & Dreyfus, New York, Self-Acting Lubricator.
Chalmers Spence Company, Philadelphia, Pa., Composition Roller and Steam Pipe Covering.
Gun Powder Pile-Driving Company, Philadelphia, Pa., Gun Powder Pile-Driver.
Chard & Howe, New York, Lubricating Cup and Compound.
Branch, Crookes & Co., St. Louis, Mo., Adjustable Countershaft, Hanger, and Belt-Tightener.
Geo. V. Cresson, Philadelphia, Pa., Pulleys, Hangers, Couplings, Wall Boxes, etc.
John A. Roebling's Sons & Co., Trenton, N. J., Wire Rope, Rigging, etc.
Adam Carr, New York, Steam Pump, Steam Radiator, Hoisting Engines, Condenser.
Poole & Hunt, Baltimore, Md., Pulleys, Feed-Water Heater.
Mason W. Volney & Co., Providence, R. I., Friction Clutches and Pulleys, etc.
Charfield, Underwood & Co., New York, Angular Belting.
John Charlton, Philadelphia, Pa., Clamp Coupling for Shafts, with Pulley.
B. F. Sturtevant, Boston, Mass., Fan Blowers.
Stow & Burnham, Philadelphia, Pa., Flexible Shaft and Tools, and Machine Operated, etc.
Exeter Machine Works, Boston, Mass., Steam Boiler.
Edward Brown, Philadelphia, Pa., Pyrometers for Blast Furnaces, etc.
Shapleigh & Wells, Binghamton, N. Y., Boilers.
Harrison Boiler Works, Philadelphia, Pa., Sectional Safety Steam Boiler.
John A. Reed, New York, Tapering Corrugated Sectional Boilers.
Sierer Lake Company, Boston, Mass., Self-Lubricating Steam Packing.
J. R. Ritter, Hydraulic Hoisting Apparatus.
W. A. Rogers, for E. Lyon, Hydraulic Jacks.
Richard Dudgeon, New York, Hydraulic Jacks and Punches.
Vulcanized Fibre Company, Wilmington, Del., Pipes.
G. H. & F. M. Roots, Connersville, Ind., Blowers, etc.
James Eccles, Philadelphia, Pa., Screw Power Press, Drawbridge Pivot, etc.
Merchant & Co., Philadelphia, Pa., Seamless Brass and Copper Tubes.
United States Hoisting and Conveying Company, New York, Hoisting and Conveying Apparatus.
Samuel S. Bent, New York, Shaking Grate Bars for Steam Boilers.
Bolen, Crane & Co., Newark, N. J., Compound Hydraulic Press.
Hartford Steam Boiler Inspection and Insurance Company, Hartford, Conn., Scale and Defective Iron from Steam Boilers, etc.
National Tube Works, Boston, Mass., Iron Boiler Tubes, Hydraulic Steam and Water Pipes.
Evans, Dalzell & Co., Pittsburgh, Pa., Boiler, Oil Well, Artesian and Hydraulic Tubing, etc.
Bridgewater Iron Company, Bridgewater, Mass., Seamless Copper and Brass Tubes.
Geo. C. Howard, Philadelphia, Pa., Hoisting Machine.
Exeter Machine Works, Boston, Mass., Pressure Blowers, Fan Blowers and Exhaust Fans.
Francis Murphy, Streator, Ill., Ventilating Apparatus for Mines, Tunnels, etc.
I. P. Morris & Co., Philadelphia, Pa., Blast Engine.
F. L. & A. Speiss, New York, Belt Clamps.
Edward Purvis, Automatic Steam Valve.
Allison & Bannon, Port Carbon, Pa., Air-compressing Engines.
W. Barnet Le Van, Philadelphia, Pa., Damper Regulator and Grate Bars.
Shire Governor Company, Bethlehem, Pa., Governor and Motor.
Tupper, W. W. & Co., New York, Grates for Steam Boiler Furnaces.
J. W. Connery, Philadelphia, Pa., Concave Calking for Steam Boilers, etc.
L. B. Tupper, New York, Furnace Grate Bars.
James Bates, Baltimore, Md., Hand Elevators.
Thomas Foulds, Jr., Trevorton, Pa., Condenser.
Stillman B. Allen, Boston, Mass., Governor.
A. H. Woodruff, Lansing, Iowa, Gear for Locomotive and Propeller Engines, etc.
J. B. Davis, Hartford, Conn., Feed-Water Heater and Purifier.
H. F. Haurey, Newark, N. J., Flue and Tube Brushes.
Joseph Woodruff, Rahway, N. J., Balanced Steam Damper Regulator.
Schutte & Gehring, Philadelphia, Pa., Koerting's Patent Steam Jets.
Benedict & Burnham, Waterbury, Conn., Copper and Brass Tubes, Seamless.
A. B. Cook & Co., Erie, Pa., Adjustable Dead Pulleys, etc.
Howard Safety Boiler Manufacturing Company, Boston, Mass., Safety Sectional Wrought-Iron 9-inch tube Boiler.
Morris, Tasker & Co., Philadelphia, Pa., Wrought-Iron Tubes, Tools and Brass Work.
Burleigh Rock Drill Company, Fitchburg, Mass., Air Compressor.
Union Rock Drill Company, New York, Air Compressing Engine.
S. S. Jamison, Saltsburg, Pa., Steam Water Injector.
A. B. Jones, Steam Traps.
Charles W. Hunt, Broadway, N. Y., Coal Hoist and Railway.
I. & G. Firmenich, Buffalo, N. Y., Boiler.
Copeland & Bacon, New York, Reversible Winding Engine, and Differential Geared Hoisting Engine.
William Sellers & Co., Philadelphia, Pa., Injector.
William Sellers & Co., Philadelphia, Pa., Shafting, Couplings and Hangers.
Baird & Huston, Philadelphia, Pa., Horizontal Tubular Boiler.
Jones & Laughlin, Pittsburgh, Pa., Shafting, Hangers, Pulleys, &c.
Weimar Machine Works, Lebanon, Pa., High-Speed Blowing Engine.
Lonergan & McBride, Philadelphia, Pa., Oil Cups and Lubricators.
Cook & Pulrer, New York, Lubricating Cups.
Asbestos Patent Fire Company, Philadelphia, Pa., Packing.
T. R. Pickering, Portland, Conn., Governors for Steam-engines.
S. S. Vail, Keokuk, Iowa, Boiler (steam).
William Burnett, Baltimore, Md., Lubricating Apparatus for Steam Engines.
American Tube Works, Somerville, Mass., Seamless Tubes, &c.
Jerome Wheelock, Worcester, Mass., Steam Engine Piston-Packing.
W. C. Allison & Co., Philadelphia, Pa., Tubes and Pipes.
Rogers & Black, Philadelphia, Pa., Boiler.
Babcock & Wilcox, New York City, Sectional Safety Steam Boiler.
Webster, S., Canada, St. Catharine, Oil-Storing Tank.

Steam Engines.—Erie City Iron Works, Erie, Pa. (stationary and horizontal); Wells Balance Engine Co., New York (double-piston); Shapleigh & Wells, Binghamton, N. Y. (and for boilers); Lane & Bodley, Cincinnati; Chas. W. Ervien & Bros., Philadelphia (horizontal and vertical); Harkins Steam Engine Co., Fitchburg, Mass. (interchangeably made engines); Ward B. Snyder, New York (and for boilers). Jacob Naylor, Philadelphia; Buckeye Engine Co., Ohio (automatic, cut-off and throttling); Geo. W. Wardwell, Rutland, Vt. (valveless); C. C. Klein, Philadelphia (eccentric piston); Ledgerwood Manufacturing Co., New York (rotary hoisting and elevating); H. R. Worthington, New York; T. F. Rowland, Greenpoint, N. Y. (pillar beam engine,; The Wm. Cramp & Sons Steam-Engine Building Co., Philadelphia (single and compound marine); Wissner & Strong, Pittsburgh, Pa. (with appliances); H. & F. Blandy, Zanesville, Ohio; New York Safety Steam Power Co., New York (and boiler); R. O. Moorhouse & Co., Philadelphia (with gear); Cornell University Machine Shop, Ithaca, N. Y.; Copeland & Bacon, New York; Colt's Patent Fire Arms Co., Hartford, Conn. (and for steam cylinder in boiler); Griffith & Wedge, Zanesville, Ohio (vertical portable); Hartford Foundry & Machine Co., Hartford, Conn.; Bowser, Prentiss & Fall, Fort Wayne, Ind.; Hampson, Whitehill & Co.; Baird & Huston, Philadelphia; R. Wetherill, Chester, Pa. (with self-packing piston); George Brush, Montreal; George Fleming & Sons, St. John, N. B. (oscillating).

Gauges, Cocks, Valves, etc.—B. E. Lehman, Bethlehem, Pa. (also oil cups); Utica Steam Gauge Co., Utica, N. Y. (also counters and gauge testers); Walworth Manufacturing Co.; Tarecki Manufacturing Co., Erie, Pa.; Chapman Valve Manufacturing Co., Boston; Cooper, Jones & Ladbury, Philadelphia; Edson Gauge Manufacturing Co., New York; Edward Purvis; G. W. & H. W. Middleton, Philadelphia; H. Belfield & Co., Philadelphia; Geo. R. Kirk, Philadelphia; Woodruff & Beamont, Kankakee City, Ill.; Peet Valve Co., Boston; Eaton, Cole & Burnham Co., New York; John Ritchie, Toronto (and lubricators); James Morrison, Toronto.

Pumps.—Silsby Manufacturing Co., Seneca Falls, N. Y. (rotary); Goulds Manufacturing Co. (hand and power and hydraulic rams); Hydraulic & Drainage Co. (steam pressure and vacuum): J. A. Grosvenor, Jersey City (pulsometer); G. S. Follensbee, Lewiston, Me. (double propeller); Wm. D. Hooker, Dedham, Mass. (direct-acting steam); W. & B. Douglass, Middletown, Conn. (hand and power and hydraulic rams); Adam Carr, New York; Ramsey & Co., Seneca Falls, N. Y. (and hydraulic rams); Union Manufacturing Co., New Britain, Conn. (including boiler, pumps and hydraulic rams); Hubbard & Aller, Brooklyn, N. Y.; Aquometer Steam Pump Co., Philadelphia; Wm. E. Kelley, New Brunswick, N. J.; W. H. Harrison, Philadelphia (double-acting two-valve pump); Frederick Spiess, New York (Behren's steam); L. J. Knowles; Nye, Gourlay & Co., Chicago (steam vacuum); Niagara Steam Pump Works, Brooklyn, N. Y. (direct-acting); Bagley & Sewall, Watertown, N. Y. (with self-packing joints); Abraham Huffer, Hagerstown, Md. (automatic steam vacuum); G. F. Blake; Cooper, Jones & Cadberry, Philadelphia; C. C. Jones, New Brunswick; C. C. Burns, St. John, N. B. (rotary); E. Bowes & Sons, Stratford, Ontario; Oakville Manufacturing Co., Oakville, Ont.; H. W. Cox, Peterborough, Ont. (rotary); Robert Patrick, Galt, Ont. (rotary).

Belting.—Alexander Bros. Packing Co., Philadelphia; Anton Heim, New York; Page Belting Co., Concord, N. H.; E. B. Richie; A. Burgess & Son; Charles A. Schieren, New York; Thos. J. Rorer, Philadelphia; W. P. Powers (for wire belting); G. S. Fales; J. B. Hoyt & Co., New York; P. Jewell & Sons (for belting and metallic-tipped laces); H. L. Fairbrother & Brother, Providence, R. I.; Dixon, Smith & Co., Toronto.

GROUP XXI.—MACHINE TOOLS FOR WOOD, METAL AND STONE.

The judges for this group are:

American—Irving M. Scott, San Francisco; George H. Bullock, Springfield, Mass.; W. F. Durfee, Wisconsin; Prof. John A. Anderson, Manhattan, Kan. *Foreign*—John Anderson, LL. D., C. E., President, Great Britain; Commandant F. Perrier, France; C. A. Angstrom, Sweden; Auguste Gobert, *fils*, Secretary, Belgium; Felix Reifer, Austria.

Wood-Working Machinery.—J. A. Fay & Co., Cincinnati; J. H. Blaisdell, Philadelphia; E. & F. Gleason, Philadelphia; Richards, London & Kelley, Philadelphia; Goodell, Braun & Waters, Philadelphia; J. S. Graham & Co., Rochester (with tools); Greenwich Machine Works, Greenwich, N. Y. (Weaver's Machines); Power, Painter & Co., Philadelphia; H. B. Smith, Smithville, N. J.; Baxter D. Whitney, Winchester, Mass.; S. A. Woods Machine Co., Boston; First & Pryibil, New York. Also the following for special machines under this head: *Dovetailing Machine.*—Battle Creek Machine Co., Battle Creek, Mich.; M. F. Boult, Cincinnati; R. J. Gould, Newark, N. J.; Knapp Dovetailing Machine Co., Northampton, Mass.,—Moody street. *Scroll and Band Saws.*—Henry Lloyd Beach, Montrose, Pa.; C. Meiners & Son, Philadelphia; C. B. Rogers & Co., Norwich, Conn.; Trump Bros., Wilmington, Del.; Walker Bros., Minneapolis, Minn.; Richards, London & Kelley, Philadelphia; First & Pryibil, New York; Bentel, Margedant & Co., Hamilton, Ohio. *Other Sawing Machinery*—E. C. Atkins, Indianapolis; E. P. Allis & Co., Milwaukee; Chase Turbine Manufacturing Co., Orange, Mass.; Henry Disston & Sons, Philadelphia (circular and other saws); John L. Knowlton's Estate, Sharon Hill, Pa. (gig saw); Lane & Bodley, Cincinnati (portable circular); Lane Manufacturing Co., Montpelier, Vt.; E. W. Ross, Fulton, N. Y.; Simonds Manufacturing Co., Fitchburg, Mass. (circular saws); Stearns Manufacturing Co., Erie, Pa.; R. H. Smith & Co., St. Catherines, Ont.; E. Andrews, Williamsport, Pa.; First & Pryibil, New York; Bentel, Margedant & Co., Hamilton, Ohio; American Saw Co., Trenton, N. J.

Also the following:

Douglass Manufacturing Company, Seymour, Conn., Mechanics' Edge Tools and Boring Implements for Wood.
John W. Griffiths, New York, Wood-bending Machine.
Howard Manufacturing Company, Belfast, Me., Miter Machines.
Lane & Bodley, Cincinnati, Ohio, Stroke Power Mortisers.
C. B. Rogers & Co., Norwich, Conn., Boring, Mortising, Tenoning, Planing, &c., Timber-Graining Machine.
Lordly, Howe & Co., St. John's, N. B., Turning Lathe.
W. M. Kennedy & Sons, Owen Sound, Ontario, Facing and Jointing Machine.
Bentel, Margedant & Co., Hamilton, Ohio, Planing Machines.
Walker Brothers, Minneapolis, Minn., Paneling Machine.

The following are chiefly *metal-working machines* in this group:

Union Stone Company, Boston, Mass., Emery Wheels and other Grinding Machines.
Stow & Burnham, Philadelphia, Pa., Flexible Shaft for Transmitting Power.
F. Armstrong, Bridgeport, Conn., Lathe Dogs and Breast Drills.
William L. Conel, Saw-sharpening Machines.
J. H. Cooper, Philadelphia, Pa., Method of Changing Continuous Motion into Intermittent (circular).
Howard Iron Works, Buffalo, N. Y., Bolt Cutter (Schienker's).
Hendey Machine Company, Wolcottville, Conn., Planing Machine.
Old Colony Rivet Works, New York City, Planing and Shaping Machine.
Isaac P. Richards, Providence, R. I., Punches.
Stiles & Parker Press Company, Middletown, Conn., Stamps, Dies and Power Hammers.
A. J. Wilkinson, Boston, Mass., Planing Machine and Lathes.
American Saw Company, Trenton, N. J., Punching, Shearing and Pressing Machines.
American Twist Drill Company, Woonsocket, R. I., Machines for Grinding Emery Wheels.
Cooper, Jones & Cadbury, Philadelphia, Pa., Lathes.
Empire Portable Forge Company, Troy, N. Y., Portable Forge.
Fitchburg Machine Company, Fitchburg, Mass., Lathes, Drills, etc.
Flather & Co., Nashua, N. H., Machine Tools.
Hillis & Jones, Wilmington, Del., Radial Drilling Machine.
George C. Howard, Philadelphia, Pa., Grindstone "Hacker."
Hull & Belden Company, Danbury, Conn., Forging Hammers and Drop Forges.
Jones, Lamson & Co., Winchester, Vt., Screw-cutting Machines.
Thorne, De Haven & Co., Philadelphia, Pa., Portable Drilling Machine.
W. H. Merriman, West Meriden, Conn., Power Punching Press.
A. F. Prentice & Co., Worcester, Mass., Lathes and Drills.
J. H. Sternberg, Reading, Pa., Surface Grinding Machine.
C. A. & W. L. Teal, Philadelphia, Pa., Punching and Shearing Machine.
C. Van Haagen & Co., Philadelphia, Pa., Drills, Drill Attachment, Drill Grinders, etc., Boring Tools and Slide Rest.
James Watson, Philadelphia, Pa., Gap Lathe.
Wicaco Screw Company, Philadelphia, Pa., Screws, Circular Cutters, etc.
Charles Merrill & Sons, New York, Drop Hammer.
J. E. Mitchell, Philadelphia, Pa., Grindstones and Fixtures.
Oneida Steam Engine & Foundry Company, Oneida, N. Y., Lathe Chucks.
E. J. Worcester & Co., Worcester, Mass., Pillar Drills.
John Roach & Son, New York City, and Chester, Pa., Wrought-Iron Forgings.
R. S. Newbold & Son, Norristown, Pa., Metal Shearing Machines.
Hewett & Follansbee, Washington, D. C., Filing and Setting Machine.
J. F. Fisher & Co., Canada, Kinkardine, Ontario, Clipping Boiler Plate Machine.
McKechnie & Bertram, Canada, Dundas, Ontario, Wood Moulding Machines and Radial Drill.
H. Hammond & Co., Hartford, Conn., Drop Forgings.
Billings and Spencer Company, Hartford, Conn., Drop Forgings.
Morse Twist Drill Company, New Bedford, Mass., Twist Drills, Circular Cutter, &c.
Bradley Manufacturing Company, Syracuse, N. Y., Rubber-Cushioned Helve Hammer.
Northampton Emery Wheel Company, Leeds, Mass., Machine for Grinding with Emery.
Bliss & Williams, Brooklyn, N. Y., Presses and Lathes.
Ames Manufacturing Company, Chicopee, Mass., Lathes, Drills, and other Machine Tools.
Brown & Sharpe Company, Providence, R. I., Machine Tools for Metals.
Brainard Milling Machine Company, Hyde Park, Mass., Milling and other Metal-working Machines.
Washburn Machine Shop, Worcester, Mass., Machine Tools for Metals.
Putnam Machine Company, Fitchburg, Mass, Machinists' Tools.
Ferris & Miles, Philadelphia, Pa., Machine Tools and Steel Hammers.
Pratt & Whitney Company, Hartford, Conn., Machine Tools for Metals.
William Sellers & Co., Philadelphia, Pa., Steam Hammers and Machine Tools.

Parallel Vises.—Stephens Patent Vise Co., New York; Bailey Wringing Machine Co., New York; Fisher & Norris, Trenton, N. J.; Thomas Hall, Philadelphia.

AWARDS IN VARIOUS GROUPS.

Dixon Crucible Company, Jersey City—Graphite Crucibles.
Cedar Hollow Lime Company, Philadelphia—Model of Car for Transporting Lime.
Tilton & Sibley, Philadelphia—Varnishes.
Stinson & Babcock, Boston—Varnishes.
F. S. Pease, Buffalo, N. Y.—Lubricating and Improved Machinery Oils.
The Main Manufacturing Company, New York—The Philosopher's Oil Tester.
Wm. F. Nye, New Bedford, Mass.—Lubricating Oils.
Wisconsin Central Railroad Company—Woods and Planks.
Richmond, Backus & Co., Detroit—Railroad Ticket Case.
Gardner & Co., New York—Seats for Railroad Cars.
Lewis W. Leeds, New York—Diagrams of Improved Methods of Ventilating and Heating.
Excelsior Lantern Company, or Miller & Eastmead, New York—Lanterns.
Wm. G. Creamer, New York—Car Lamps.
Henry Disston & Sons, Philadelphia, Pa.—Saws, Trowels, Plumbs, Levels, Squares, Hinges, &c.
Nicholson File Company, Providence, R. I.—Files and Rasps.
Eben Moody Boynton, New York—Saws in great Variety. (Special Patent Lightning Saws).
Baeder, Adamson & Co., Philadelphia, Pa.—Sand Paper, Emery Paper, and Emery Cloth.
Stevens Patent Vise Company, New York—Parallel Vises and Planer Chucks.
Western File Works, Beaver Falls, Pa.—Files, Rasps, &c.
Fisher & Norris, Trenton, N. J.—Anvils, Vises, &c.
McCaffrey Bros., Philadelphia, Pa.—Hand-cut Files and Rasps.
G. & H. Barnett, Philadelphia, Pa.—Hand-cut Files and Rasps.
Douglass Manufacturing Company, Seymour, Conn.—Chisels, Augers, Auger Bits, Draw Knives.
H. Hammond & Co., Hartford, Conn.—Steel Hammers and Drop Forgings.
I. H. Sternberg, Reading, Pa.—Bolts, Nuts, &c.
A. G. Coes & Co., Worcester, Mass.—Screw Wrenches.
Morse Twist Drill and Machine Company, New Bedford, Mass.—Screwplates, Wrenches, Stocks, Dies, Chucks, &c.
W. C. Allison & Sons, Philadelphia, Pa.—Bolts, Nuts, Screws, &c.
Hoopes & Townsend, Philadelphia, Pa.—Bolts, Nuts, Screws, Rivets, &c.
Pennsylvania Tack Works, Norristown, Pa.—Tacks, Shoe Nails, &c. (Copper and Iron).
American Saw Company, Trenton, N. J.—Circular Mill, Crosscut Saws.
Edward H. Knight, Philadelphia, Pa.—Patent Wrench (adjustable).
American Dredging Company, Philadelphia—Dredging Machine.

For Car and Carriage Varnishes medals were awarded to the following:

Felton, Rau & Sibey, Philadelphia.
C. C. Phillips & Co., Philadelphia.
D. Rosenberg & Co., New York.
C. T. Raynolds & Co., New York.
E. Smith & Co., New York.

There remain a few American and probably many foreign awards which we hope to present soon.